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PHYLOGENY AND BIOGEOGRAPHY OF AUSTRALIAN GENERA OF CHLOROCYSTINI (INSECTA: HOMOPTERA: TIBICINIDAE)

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Abstract

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Six cicada genera belonging to the Chlorocystini are endemic to Australia. These (*Chlorocysta* Westwood, 1851; *Cystopsaltria* Goding and Froggatt, 1904; *Cystosoma* Westwood, 1842; *Glaucopsaltria* Goding and Froggatt, 1904; *Owra* Ashton, 1912; and *Venustria* Goding and Froggatt, 1904) can be divided into three monophyletic groups. The phylogeny and biogeography of these groups is discussed, descriptions are given of the groups and all species concerned. A key to males is presented for all species of Chlorocystini in Australia.

Introduction

The "*Baeturia* and related genera complex" was defined as a supposedly monophyletic group for which aedeagal characters are regarded synapomorphic (De Boer, 1990). Recently this complex was identified as the tribe Chlorocystini (sensu stricto) (De Boer, 1995d) comprising about 150 species attributed to 14 genera. Most species occur in New Guinea but the distribution of the tribe includes Maluku and Timor, the Bismarck Archipelago, Solomon Islands, Vanuatu, Samoa, Tonga and parts of northern and eastern Australia.

Of the 13 species in Australia two (*Thaumastopsaltria globosa* Distant, 1897 and *Guineapsaltria flava* (Goding and Froggatt, 1904)) also occur in New Guinea. All others are endemic to Australia and, apart from *Gymnotympana rufa* (Ashton, 1914) and *Gymnotympana varicolor* (Distant, 1907), belong to endemic Australian genera.

The present publication forms part of a phylogenetic and biogeographic study of the Chlorocystini (sensu stricto) and deals with the endemic Australian genera: *Chlorocysta* Westwood, 1851; *Cystopsaltria* Goding and Froggatt, 1904; *Cystosoma* Westwood, 1842; *Glaucopsaltria* Goding and Froggatt, 1904; *Owra* Ashton, 1912; and *Venustria* Goding and Froggatt, 1904. *Cystosoma* has two species, *Chlorocysta* three and the others are monotypic.

All nine species were recently discussed (Moulds, 1990) but descriptions and drawings of male genitalia are given for the first time here. The redescriptions recount the characters used in a phylogenetic reconstruction of the Chlorocystini as a whole (De Boer, 1995d). Here, the relationships of and between Australian genera are discussed separately. A computer analysis of the distribution of shared characters of all 148 species of the Chlorocystini (sensu stricto) has shown that the Australian genera can be subdivided into three groups:

1. *Cystopsaltria* and *Cystosoma*, as monophyletic group;
2. *Chlorocysta*, *Glaucopsaltria* and *Owra*, as monophyletic group; and
3. *Venustria*.

The latter takes a somewhat isolated position, but is presumably closely related to *Gymnotympana* Stål, 1861 and shares several characters with the Australian species (*G. rufa* and *G. varicolor*) (De Boer, 1995a; 1995d).

The results of phylogenetic analysis (De Boer, 1995d) are summarised and relationships within and between the Australian groups is treated in more detail. The groups are diagnosed and all species are described. A key to males of all Australian species of the Chlorocystini is presented.

Methods

The material examined for this study is preserved in the following collections: BMNH, Natural History Museum (formerly: British Museum (Natural History)), London; BPBM, Bernice P. Bishop Museum, Honolulu; CSIRO, Commonwealth Scientific and Industrial Research Organisation, Canberra; DEI, Deutsches Entomologisches Institut, Eberswalde; IZW, Polska Akademia Nauk, Instytut Zoologii, Warszawa; KBIN, Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels; Moul, personal collection Mr M.S. Moulds,

Sydney; RMNH, Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden; SEM, Snow Entomological Museum, Lawrence, Kansas; SMD, Staatliches Museum für Tierkunde, Dresden; SMF, Natur Museum und Forschungs Institut "Senkenberg", Frankfurt am Main; SMN, Staatliches Museum für Naturkunde, Stuttgart; ZIM, Zoologisches Institut und Zoologisches Museum, Hamburg; ZMA, Instituut voor Systematiek en Populatie Biologie (Zoölogisch Museum), Amsterdam; ZMB, Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt-Universität, Berlin; and ZMH, Zoological Museum of the University of Helsinki, Helsinki.

Some of the terms used in the descriptions are explained in figs 5 and 13. To examine the male genitalia the pygofer was pulled out after overnight softening, with a sharp needle inserted between the pygofer and the 8th abdominal segment. The aedeagus was pulled out at the same time by inserting the needle between the claspers. Descriptions were made from dried museum material. This drying often affects colour. Bright green becomes yellowish brown, but colour marks like blackish stripes and spots remain intact. Measurements are based on all available specimens. Only some of the most important and the most recent systematic literature concerning the genera and species is cited. For more complete lists of literature is referred to the catalogues of Metcalf (1963) and Duffels and Van der Laan (1985).

Phylogeny

In the following discussion figures in parentheses refer to apomorphies in the cladogram (fig. 1). The Chlorocystini (sensu stricto) form a monophyletic group for which an S- curved aedeagus with winged lateral crests is the supposed apomorphy (1). The phylogenetic relationships between the 148 described species of this tribe were analysed with the aid of the program PAUP (Swofford, 1993) using a data matrix of 154 characters and 409 character states (De Boer, 1995d). The tribe Prasiini was used as the sister group and the genus *Muda* as outgroup. The result of this analysis showed that on a generic level the support of some of the proposed phylogenetic relationships is very weak.

Two major subdivisions can be made. *Chlorocysta*, *Glaucopsaltria*, *Owra* and *Venustria* can be grouped with *Baeturia*, *Guineapsaltria*, *Gymnotympana*, *Papuapsaltria* and *Scottotympana* based on the following synapomorphies: proximal spine of fore femur erect (3), a smoothly vaulted pronotum without distinct medial fissure (4) and a distinct hyaline border along the hind margin of tegmen (5). Other genera have a somewhat wrinkled head and pronotum with a fairly distinct medial fissure on the pronotum and a very narrow border along the hind margin of tegmen; these character states also occur in most species of the Prasiini, the presumed sister group of the tribe.

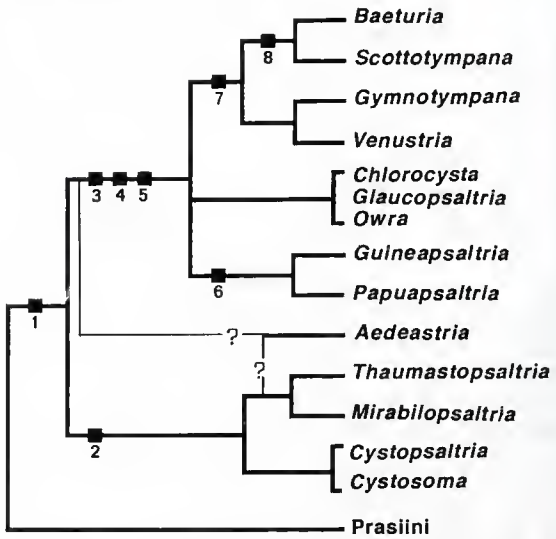


Figure 1. Tentative cladogram of the Chlorocystini. Numbers refer to apomorphies discussed in the text.

Another subdivision can be made based on male operculum size. *Venustria* forms a monophyletic group with *Baeturia*, *Gymnotympana* and *Scottotympana*. These genera share a fairly large operculum as apomorphy (7) in which the medial margin lies medial to the meracanthus. In other genera of Chlorocystini, in Prasiini and in *Muda* the medial margin of the operculum lies generally lateral to the meracanthus.

Several characters of *Venustria* are also found in *Scottotympana* and many species of *Gymnotympana* and indicate a close relationship with these two genera:

1. tegmina with reddish venation and a broad hyaline border along the hind margin;
2. a long proximal spine on the fore femur, often longer than the distance to middle spine; and
3. a very short meracanthus.

However, *Baeturia* and *Scottotympana* presumably form a monophyletic group; claspers which are not fused at the base are a presumed synapomorphy for these two genera (8). *V. superba* shares a very similarly shaped basal part of the operculum with *Gymnotympana rufa* and

G. varicolor while the female of *V. superba* shares a similar thorn-shaped protuberance on the pygofer with *G. rufa*. (De Boer, 1995a; 1995d). The last two characters suggest that *Venustria* should be included in and be synonymised with *Gymnotympana* but no unambiguous synapomorphy for *Venustria* and *Gymnotympana* together has been found. The phylogenetic analysis showed that *Venustria* as the sister group of *Gymnotympana* is the most parsimonious solution (De Boer, 1995d).

The phylogenetic relationships between *Chlorocysta*, *Glaucopsaltria* and *Owra* and the group formed by *Baeturia*, *Guineapsaltria*, *Gymnotympana*, *Papuapsaltria*, *Scottotympana* and *Venustria* are not clear, as indicated by the polytomy in fig. 1. *Guineapsaltria* and *Papuapsaltria* are possibly sister groups, based on a very small and rounded male operculum in many of their species (6). *Chlorocysta*, *Glaucopsaltria* and *Owra* share a very broad vertex with the small ocelli wide apart with most species of *Gymnotympana* and all but one species of *Guineapsaltria*; the distance between the lateral ocelli often exceeds three times the width of the frontal ocellus. The fairly short meracanthus of the species of *Chlorocysta*, *Glaucopsaltria* and *Owra* and the vague colour pattern found on the head and thorax of two of the *Chlorocysta* species, might indicate a close relationship with *Gymnotympana*, *Scottotympana* and *Venustria*. The phylogenetic analysis showed that a reconstruction with *Chlorocysta*, *Glaucopsaltria* and *Owra* as sister group of *Baeturia*, *Gymnotympana*, *Scottotympana* and *Venustria* is slightly more parsimonious than the option with *Guineapsaltria* and *Papuapsaltria* as sister group of that group. On a tree with a total length of 906 steps the latter option is only one step longer (De Boer, 1995d).

Cystosoma and *Cystopsaltria* share a strongly furrowed pronotum and a very narrow border along the hind margin of tegmen with *Aedeastria*, *Mirabilopsaltria* and *Thaumastopsaltria*, a strongly bent proximal spine on the fore femur with *Mirabilopsaltria* and *Thaumastopsaltria* and an angularly protruding postclypeus with *Thaumastopsaltria*. All these characters are also widely distributed in Prasiini and are presumed plesiomorphic. Furthermore, *Cystosoma* and *Cystopsaltria* have small male opercula which are regarded plesiomorphic; the opercula of *Cystosoma schultzi* and *Cystopsaltria immaculata*, though relatively small, do slightly extend medially of the meracanthus but the operculum of *Cystosoma saundersii* does not. The two species of *Cystosoma* and most species of *Thaumastopsaltria* and *Mirabilopsaltria* have a narrow tymbal cavity; the tergite part between the auditory capsule and the 2nd sternite is very short. This character is presumably apomorphic for *Cystosoma*, *Cystopsaltria*, *Mirabilopsaltria* and *Thaumastopsaltria* together but then lost in some of the species (2). It is not clear whether or not *Aedeastria* should also be included in this group; though *Aedeastria* has a wide tymbal cavity it shares distinct diverging fissures on the vertex as a possible synapomorphy with *Mirabilopsaltria* and *Thaumastopsaltria*. The erect fore femoral spine of *Aedeastria*, however, suggests a monophyletic origin with the group containing *Baeturia*, *Chlorocysta*, *Glaucopsaltria*, *Gymnotympana*, *Guineapsaltria*, *Owra*, *Papuapsaltria*, *Scottotympana* and *Venustria* (see fig. 1 questionmarks)

The coloured tegmina of *Cystosoma* and *Cystopsaltria* which are also found in *Mirabilopsaltria* and *Thaumastopsaltria* might also indicate a relationship between these genera though this character is also found in some genera of Prasiini.

Biogeography

Biogeographic patterns of Chlorocystini and a similarly distributed group of cicadas, the subtribe Cosmopsaltriaria, were recently compared and analysed (De Boer, 1995c). It appears that most of the species of these groups are found on terranes derived from a historic oceanic island arc, which developed since about 40 million years ago as a result of subduction of the former Tethys Sea under the Pacific tectonic plate (De Boer, 1995c). This arc is known as the Outer Melanesian Arc (Hamilton 1979; Holloway, 1979, 1984; Duffels, 1986; Rangin et al., 1990a, 1990b; Daly et al., 1991). Due to the continuous northward movement of Australia and the westward movement of the Pacific this volcanic island arc broke up and fragments collided with the northern craton of Australia where they now form part of New Guinea (Pigram and Davies, 1987). It is supposed that the Outer Melanesian Arc, before breaking up, formed an important route of dispersal for south-east Asian biota invading the Pacific (Duffels 1986, Duffels and De Boer, 1990, De Boer, 1995c).

The distribution of Chlorocystini over the arc terranes, the fact that their presumed sister group (the oriental Prasiini as defined by De Jong, 1985) is most speciose in Sulawesi and that the sister group of these groups combined (the genus *Muda*) occurs in south-east Asia and the

greater Sunda Islands, suggest that the ancestor of that tribe also used the island arc as route of dispersal. In fact, the distribution and phylogeny of these cicadas reflect the geotectonic history in that the main vicariant speciation events in the cladograms correspond with presumed sequences of fragmentation of the island arc (De Boer, 1995c). This means that the ancestor of Chlorocystini originates from Asia and that all its Australian species must have invaded Australia by dispersal presumably through New Guinea (De Boer, 1995c).

Two patterns of distribution of Australian Chlorocystini can be recognized. It appears that species not belonging to endemic genera but belonging to genera found in New Guinea as well (*Guineapsaltria flava*, *Gymnotympana rufa*, *Gymnotympana varicolor* and *Thaumastopsaltria globosa*) are restricted to the northern and eastern parts of the Cape York Peninsula; the only exception (*T. globosa*) is also recorded from Groote Eylandt, NT (Moulds, 1990). This same pattern is found in several species that do not belong to Chlorocystini: *Diceropyga subapicalis* (Walker, 1868) (see Duffels, 1977), *Lembeja paradoxa* (Karsch, 1890) and *Lembeja vitticollis* (Ashton, 1912) (see De Jong, 1982) belong to non-endemic genera and are restricted to the Cape York Peninsula (Moulds, 1990).

Venustria, an endemic Australian genus that should possibly be included in *Gymnotympana* (see discussion above; De Boer, 1995a; 1995d), is also restricted to the Cape York Peninsula. The two groups of endemic Australian genera have a much wider distribution, reaching farther southward. These have a strikingly similar distribution in northern and eastern Qld, including the Cape York Peninsula and north-eastern NSW.

The distribution patterns of the species of endemic and non-endemic Australian genera and their relative positions in the cladogram suggest different ages. There must have been at least two periods of dispersal from New Guinea to Australia. For the non- Australian genera a dispersal during Pliocene-Pleistocene low sea-level stands has been proposed (De Boer, 1992b; 1995c). The two groups of endemic Australian genera branch off lower down in the cladogram and must therefore be older. Their ancestors must have reached Australia earlier, possibly following the first collision between Australia and a fragment of the Outer Melanesian Arc, which is dated at about 25 mya (Pigram and Davies, 1987; De Boer, 1995c).

For maps of distribution of the Australian species described here see Moulds (1990) and De Boer (1995c).

Key to males

1	Tegmen with variable venation, often differing between left and right tegmen of individuals, forming 9 or more apical areas and several subapical areas between apical and ulnar areas 2
—	Tegmen venation regular, with 8 or 9 apical areas, but without subapical areas 10
2(1)	Tegmen hyaline, with fairly broad hyaline border along hind margin and broad costal area. Proximal spine of fore femur erect (fig. 20). Postclypeus not swollen ventrally (figs 4, 45). Pronotum smooth, without distinct medial furrow 3
—	Tegmen opaque or weakly reddish or greenish tinged, with narrow border along hind margin and narrow costal area. Proximal spine of fore femur strongly bent, adjacent to femur (fig. 60). Postclypeus distinctly swollen ventrally (fig. 70). Pronotum with distinct medial furrow 7
3(2)	Aedeagus Z-curved in apical part, proximal part straight (cf. fig. 12). Tymbal with 9 or more ridges 4
—	Aedeagus S-curved (figs 31, 42). Tymbal with 6–8 ridges ... 6
4(3)	Head and thorax without colour markings. Tymbal with 9–10 ridges. Clasper base forming a low collar around base of anal valves, which is sloping proximally of aedeagus (fig. 6). Aedeagus not incised at apex (figs 11, 12) ..... *Chlorocysta vitripennis*

— Head and thorax with pattern of dark brown spots and stripes. Tymbal with 11–12 ridges. Clasper base forming a high collar around base of anal valves, which is erect proximally of aedeagus (figs 14, 25). Aedeagus incised at apex (figs 18, 27) 5

5(4) Distomedial corner of operculum not reaching medially of meracanthus (fig. 24). Ventral part of postclypeus darkly suffused. Tymbal with 12 ridges, 4 of which do not reach ventral tymbal margin ..... *Chlorocysta suffusa*

— Distomedial part of operculum almost pointed, elongate, reaching medially of meracanthus (fig. 15). Ventral part of postclypeus not darkly suffused. Tymbal with 11 ridges, 4 of which do not reach ventral tymbal margin ..... *Chlorocysta fumea*

6(3) Body length over 28 mm. Abdomen strongly inflated. Seventh tergite wedge- shaped in lateral view, long dorsally and short at ventral margin; pygofer turned to a ventral position. Distal part of operculum longer than basal part and reaching beyond apex of meracanthus (fig. 44). Wing with 6 apical areas .... *Glaucopsaltria viridis*

— Body length under 18 mm. Abdomen weakly inflated. Seventh tergite not wedge- shaped in lateral view; pygofer directed posteriad. Distal part of operculum much shorter than basal part and not reaching to apex of meracanthus (fig. 33). Wing with 5 apical areas ..... *Owra insignis*

7(2) Tegmina rounded at apex, venation not reticulate. Wings with 6 apical areas. Pronotum not forming a sharply edged lateral crest. Head and pronotum not triangle-shaped; anterior margins of postclypeus and vertex lobes not forming a continuous line with lateral margins of pronotum. Cruciform elevation of mesonotum broader than long across its centre. First and second sternites not adjacent. Clasper straight, with broad domed clasper hollow and with laminiform and sharply pointed medial protrusion. Tymbal with 6 ridges ..... *Thaumastopsaltria globosa*

— Tegmina pointed at apex, venation reticulate in distal half. Wings with more than 6 apical areas. Pronotum forming a sharply edged lateral crest. Head and pronotum triangle-shaped; anterior margins of postclypeus and vertex lobes forming an almost continuous line with lateral crest of pronotum. Cruciform elevation of mesonotum narrower than long across its centre. First and second sternites adjacent. Clasper hook-shaped, with narrow clasper hollow in downwardly directed apical part and without medial protrusion. Tymbal with 7 or more ridges 8

8(7) Veins CuA and M not fused at corner of basal area (fig. 72). First radial area of tegmen divided by longitudinal vein. Venation of apical and ulnar areas reticulate. Pygofer opening narrow, V-shaped (fig. 78). Aedeagus with dorsal appendages near its apex (figs 85, 86). Tymbal with 10 ridges .*Cystopsaltria immaculata*

— Veins CuA and M fused at corner of basal area (fig. 81). First radial area of tegmen not divided. Venation of apical areas reticulate, ulnar areas normal. Pygofer opening broad, U-shaped (fig 57). Acdeagus without dorsal appendages (figs 62, 77). Tymbal with 7 ridges 9

9(8) Body length over 40 mm. Abdomen globularly inflated. Medial margin of operculum not reaching medially of meracanthus (fig. 68). ..... *Cystosoma saundersii*

— Body length under 30 mm. Abdomen distinctly but not globularly inflated. Medial margin of operculum reaching medially of meracanthus (fig. 71) ..... *Cystosoma schmeltzi*

10(1) Wing with extremely slender anal fields; 2nd anal field rudimentary, not hyaline. Abdomen with reddish ventral band. Tergites sharply folded towards sternites ventrolaterally. Ventral part of pygofer not incurved to its margins; ventral and basal margins of pygofer forming a continuous, sharply edged, ridge 11

— Wing with broad anal fields; 2nd anal field distinct and hyaline. Abdomen without reddish ventral band. Tergites gradually curved towards sternites ventrolaterally. Ventral part of pygofer gradually incurved to its margins; ventral and basal margins of pygofer not forming a sharply edged ridge 12

11(10) Tymbal with 5 ridges. Tymbal and lateral part of 2nd tergite separated by broad wedge-shaped cavity. Second tergite strongly curved between auditory capsule and 2nd sternite. Caudodorsal beak erect and conically shaped; its lateral margins curving inwards and fusing. Aedeagus short and almost straight, directed upwards, not reaching beyond ventral margin of pygofer ..... *Gymnotympana rufa*

— Tymbal with 4 ridges. Tymbal and lateral part of 2nd tergite separated by narrow gap. Second tergite straight between auditory capsule and 2nd sternite. Caudodorsal beak strongly curved, but not conically shaped, its lateral margins not fusing. Aedeagus long and strongly curved down, reaching beyond ventral margin of pygofer ..... *Gymnotympana varicolor*

12(10) Body length over 20 mm. Operculum large, covering most of tymbal cavity and reaching medially of meracanthus. Basal part of operculum medially distinctly longer than laterally (fig. 55). Tegmina slightly bronzed, with 9 apical areas. Clasper broad and lobate, with large clasper hollow and strongly curved down, not forming a shaft around aedeagus (fig. 51). Aedeagus erect, its apex adjacent to base of anal valves. Aedeagus broad, swollen in proximal part and without subapical lobe ..... *Venustria superba*

— Body length under 16 mm. Operculum small, not covering tymbal cavity and not reaching medially of meracanthus. Basal part of operculum oblong. Tegmina clear hyaline, with 8 apical areas. Clasper long, slender and straight, without distinct clasper hollow, directed posteriad and forming a shaft around aedeagus. Aedeagus directed posteriad between claspers, its apex near apex of clasper. Aedeagus very slender, with distinct subapical lobe. ..... *Guineapsaltria flava*

Chlorocysta, Glaucopsaltria and *Owra*

Description. The species of *Chlorocysta* and *Glaucopsaltria* are large compared to other Chlorocystini, body length 20–33 mm; only *Owra* is distinctly smaller, under 16 mm. Body reddish brown or greenish, generally uniformly coloured, but abdomen often with reddish segmental hind margins and a row of dark coloured ventrolateral spots. Male abdomen strongly inflated 1.4–2.3 × as long as head and thorax together, in females 0.9–1.2 ×. Head broad and short (fig. 3), 2.4–3.0 × as wide as long and 1.8–2.2 × as wide as distance between eyes. Postclypeus broad and bluntly rounded anteriorly, 2.3–3.3 × as wide as long. Anterior margin of postclypeus continuous with anterior margins of vertex lobes. Sides of postclypeus with about 8–10 distinct furrows, ending in short rows of short parallel ridges, which form a narrow band along

lorum. Postclypeus not swollen ventrally; anterior margin (lateral view) straight or weakly convex (fig. 4). Vertex very broad and smooth; diverging fissures from centre of head to corners of postclypeus weakly developed. Vertex lobes sometimes with some weak longitudinal wrinkles. Vertex 1.7–2.4 × as wide as long; 1.3–1.6 × as wide as postclypeus and 1.6–2.4 × as wide as eye. Ocelli small and far apart. Distance between lateral ocelli 2.4–4.1 × width of frontal ocellus and 0.8–1.2 × distance between lateral ocellus and eye. Pronotum 2.3–2.6 × as wide as long and fairly smooth, without medial furrow. Pronotal collar laterally weakly amplified and slightly curving down at anterior margin of lateral amplifications. Tegmina and wings hyaline, venation reddish or sometimes ochraceous. Tegmen venation variable with 9–15 apical areas and a more or less continuous band of subapical areas. Costal area hyaline and very distinct, widening towards tegmen apex. A distinct hyaline border along hind margin of tegmen (fairly narrow in *Owra*). Wings with 5, in *Glaucopsaltria* 6, apical areas and a distinctly broader hyaline border than in tegmina. Legs ochraceous and unmarked. Fore femur (fig. 20) with row of 3 erect and sharply pointed spines, diminishing in length towards tibia. Tymbal with 6–12 parallel sclerotized ridges. The most proximal ridges often not reaching ventral margin of tymbal. Short intercalary ridges forming a lateral band at half- width across tymbal. Opercula very small. Basal part of operculum slightly vaulted with two rounded elevations and weakly wedge-shaped; longest medially and gradually tapering towards lateral margin. Basal part with distinct crest around its distolateral corner, lateral part of this crest very short and in males often globularly swollen. Distal part of operculum in males angularly oblong and longer than basal part (though extremely short in *Owra*) and not, or only partly covering tymbal cavity in ventral view; often leaving most of folded membrane exposed. Lateral margin of male operculum straight or weakly convex, slightly directed mesiad and forming a distinct and obtuse angle with crest of basal part and with straight distal margin. The straight medial margin lies laterally of meracanthus. Meracanthus fairly short, but generally reaching beyond operculum. Female operculum shorter than in male and sickle-shaped. Male abdomen very delicate and distinctly inflated. First tergite in male medially often more than half as long as 2nd tergite (but *Glaucopsaltria* with extremely long 2nd tergite) and not hidden under metanotum. Middorsal part of second tergite hardly longer than lateral parts, proximal margin of second tergite weakly convex medially. Lateral parts of 2nd tergite weakly swollen at anterior margins and adjacent to tymbals. Tergite part between auditory capsules and sternite 2 almost straight, forming a distinct ridge along tymbal cavity. Sternites 1 and 2 not adjacent (fig. 13 arrow). Auditory capsules not swollen, hardly elevated relative to connecting bar between abdomen and tymbal. Female abdomen shorter and more robust than that of male, with short and broad pygofer (fig. 22). Ovipositor sheaths almost reaching to apex of sharply pointed caudodorsal beak. Male pygofer short and rounded, with convex distal and ventral margins. Caudodorsal beak short and erect; not curving over basal part of claspers or anal valves and bluntly rounded, truncate, or rectangular at apex. Lateral lobes of pygofer weakly curved inwards with small, weakly inflated, protuberances. Ventral margins of pygofer converging, generally forming a sharp angle at base of pygofer opening. Claspers fairly slender and hook-shaped; sharply curving down at half-length. Apical part of clasper with large, sharply edged, clasper hollow (in *Owra* without clasper hollow). Claspers weakly diverging towards rounded apices. Basal part of clasper forming a continuous ring-shaped collar around base of anal valves. Aedeagus S-curved (in *Chlorocysta* more Z-curved in apical part), with very narrow lateral crests along proximal part.

Monophyly of the three genera. In the following discussion figures in parentheses refer to apomorphies in the cladogram (fig. 2). *Chlorocysta*, *Glaucopsaltria* and *Owra* form a monophyletic group based on the following synapomorphies: 1, a continuous band of subapical areas in tegmen; 2, a wedge shaped basal part of operculum; and 3, small male auditory capsules (De Boer, 1995d).

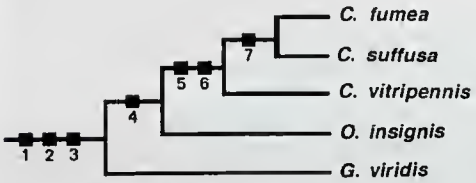


Figure 2. Cladogram of the species of *Chlorocysta*, *Glaucopsaltria* and *Owra*. Numbers refer to apomorphies discussed in the text.

The tegmen venation tends to be variable and often differs between left and right tegmen within individuals. The number of apical areas

varies from 9–10 in *Owra* to 11–13 in *Chlorocysta* and to 13–15 in *Glaucopsaltria* but is always more than 8, the number most common in related genera and in most cicadas. Furthermore, the tegmina have a more or less continuous band sometimes of a double row of subapical areas between apical and ulnar areas. Similarly high numbers of apical areas in the tegmina are also found in *Baeturia inconstans* De Boer (De Boer, 1994e), *Gymnotympana* (4 species, De Boer, 1995a), *Mirabilopsaltria* (2 species, De Boer, 1996) and all but one species of *Thaumastopsaltria* (De Boer, 1992b). A continuous band of subapical areas is regarded apomorphic for *Chlorocysta*, *Glaucopsaltria* and *Owra* (1 in fig. 2). Although in the tegmina of the species of *Gymnotympana*, *Mirabilopsaltria* and *Thaumastopsaltria* noted above some subapical areas occur, these never form a continuous band. Subapical areas do not occur in *Baeturia*.

The basal part of the male operculum is slightly wedge-shaped, longest medially and slightly tapering to its lateral margin. The opercular base is generally oblong in species of Chlorocystini but in most species of *Gymnotympana* the operculum base has its greatest length laterally (De Boer, 1995a). Only in *Gymnotympana rufa*, *G. varicolor* and *Venustria superba* the basal part of operculum is longest medially but narrows more abruptly at about one third of its width. The weakly wedge-shaped operculum base is regarded apomorphic for *Chlorocysta*, *Glaucopsaltria* and *Owra* (2).

Chlorocysta, *Glaucopsaltria* and *Owra* have small and weakly protruding auditory capsules. Although similarly unswollen capsules are present in *Thaumastopsaltria* (De Boer, 1992b) they presumably represent a parallel development and can be regarded as apomorphic for this group (3).

Phylogenetic relationships. *Chlorocysta* and *Owra* share wings with 5 apical areas synapomorphic for these genera (4). Wings with 5 apical areas occur in several genera of cicadas but only sporadically in other genera of the Chlorocystini.

The three species of *Chlorocysta* share a somewhat Z-curved aedeagus (a modification of the S-curved aedeagus, an apomorphy of the Chloroeystini) and a high number (9–12) of tymbal ridges (5, 6) as apomorphies. *Owra insignis* shares an incised aedeagal apex with *C. fumea* and *C. suffusa* but similarly incised aedeagal apices occur in several related genera (e.g., *Aedeastria*, *Guineapsaltria* and *Papuapsaltria*). *C. fumea* and *C. suffusa* are supposed to be sister species sharing a large tymbal with 11–12 ridges (7). Furthermore, these species share a wide pygofer opening and a distinct colour pattern on head and thorax but the phylogenetic value of these characters is not clear since they also occur in several related genera.

Chlorocysta Westwood

Cystosoma (Chlorocysta) Westwood, 1851: 208. — Walker, 1852: 1133.

Chlorocysta.-Stål, 1863: 575. — Goding and Froggatt, 1904: 566, 596, 658. — Distant, 1906: 153, 159. — Boulard, 1979: 35. — Duffels and Van der Laan, 1985: 249. — Moulds, 1990: 185–186. — De Boer, 1990: 64. — De Boer, 1991: 2–3. — De Boer, 1992a: 164. — De Boer, 1993a: 16–17. — De Boer, 1993b: 142. — De Boer, 1994a: 3. — De Boer, 1995a: 4, 8, 24. — De Boer, 1995b: 6.

Glaucocysta Goding and Froggatt, 1904: 566.

Mardalana Distant, 1905: 213, 215. — Distant, 1906: 154, 159. — Metcalf, 1963: 257. — Duffels and Van der Laan, 1985: 249.

Mardarana [sic] Kato, 1932: 185. — Kato, 1956: 70.

Mardalena [sic] Boulard, 1979: 46.

Type species. *Cystosoma vitripennis* Westwood, 1851.

Diagnosis. Green body. Basal part of opereulum wedge shaped. Male abdomen strongly inflated. Male auditory capsules weakly inflated. Tegmina with more than eight apical areas and continuous band of subapieal areas. Tymbal with 9–12 ridges. Aedeagus in lateral view Z-shaped near apex.

Remarks. *Chlorocysta*, originally described as a subgenus of *Cystosoma*, is the type genus of Chloroeystini Distant, 1905. The genus contains three species but several undescribed species have been distinguished (Moulds, pers. comm.). The peculiarly Z-curved aedeagus is a supposed apomorphy for *Chlorocysta*.

Chlorocysta vitripennis (Westwood)

Figures 3–13

Cystosoma (Chlorocysta) vitripennis Westwood, 1851: 208.

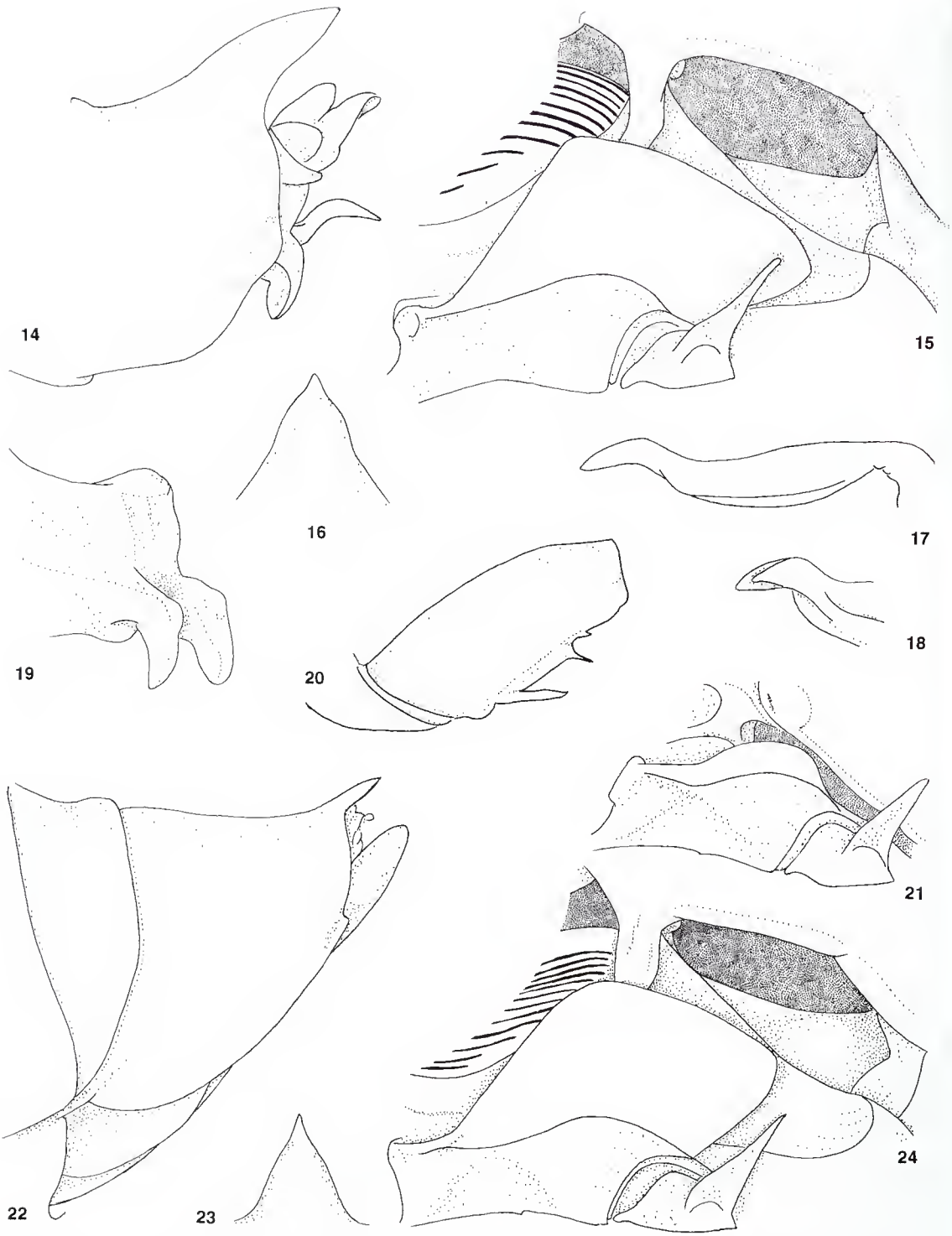
Chlorocysta vitripennis. — Goding and Froggatt, 1904: 566, 659, pl. xix fig. 6. — Distant, 1906: 159. — Burns, 1957: 643. — Metcalf, 1963: 256–257. — Duffels and Van der Laan, 1985: 249. — Moulds, 1990: 188–189, pl. 22 figs 2, 2a-b. — De Boer, 1995a: 16, 77. — De Boer, 1995b: 5.

Cicada congrua Walker, 1862: 303–304. — Goding and Froggatt, 1904: 611, 657.

Chlorocysta macrula Stål, 1863: 575. — Goding and Froggatt, 1904: 566, 659, 660.

Figures 3–13. *Chlorocysta vitripennis* Westwood, 1851: 3, male head in dorsal view, Mt Tamborine; 4, male postclypeus in lateral view, Mt Tamborine; 5, pygofer in lateral view, Mt Tamborine; 6, claspers and aedeagus, Mt Tamborine; 7, pygofer in oblique view, Mt Tamborine; 8, male caudodorsal beak in dorsal view, Mt Tamborine; 9, female operculum, Dorrigo; 10, female caudodorsal beak in dorsal view, Dorrigo; 11, aedeagus in lateral view, Mt Tamborine; 12, aedeagus in lateral view, ex. coll. v Voixem; 13, male operculum, Mt Tamborine, arrow indicating gap between sternites 1 and 2.

bp = basal part of operculum; c = crest around distolateral corner of basal part of operculum; cb = caudodorsal beak; dm = distal margin of operculum; di = distal margin of pygofer; do = dorsal margin of pygofer; dp = distal part of operculum; ho = clasper hollow; la = lateral margin of operculum; m = medial margin of operculum; me = meracanthus; mc = medial corner of operculum; pr = protubercance on lateral lobe of pygofer; ve = ventral margin of pygofer.



Figures 14–24. 14–19, *Chlorocysta fumea* Ashton, 1914: 14, pygofer in lateral view; 15, operculum; 16, caudodorsal beak in dorsal view; 17, aedeagus in lateral view; 18, aedeagal apex; 19, claspers. 20–24 *Chlorocysta suffusa* Distant, 1907: 20, male fore femur in lateral view, Cairns; 21, female operculum, Cooktown; 22, female genital segment in lateral view, Cooktown; 23, female caudodorsal beak in dorsal view, Cooktown; 24, male operculum, Julatten.

an almost right angle with slightly longer distal margin. Distal margin straight, but weakly convex near angular distomedial corner. Medial margin straight. Distal part of opereulum elongate at distomedial corner, reaching mesiad beyond apex of meracanthus. Meracanthus short, not reaching distal margin of operculum.

Abdomen. Strongly inflated, almost uniformly brown coloured, but with darkened segmental hind margins and a lateral row of darkened spots.

Genitalia. Pygofer in lateral view (fig. 14) short and globularly swollen. Dorsal margin weakly concave, convexly bending into erect caudodorsal beak. Distal margin slightly convex between beak and lateral protuberance. Ventral margin angularly convex. Ventral margins converge to a bluntly rounded angle at base of pygofer opening. Caudodorsal beak in dorsal view (fig. 16) with subapical swelling and pointed apex. Lateral lobe of pygofer with small weakly swollen lateral protuberance. Claspers (fig. 19) fused at base to a continuous and broad collar around base of anal valves. Dorsal margin of clasper ending in right angle on surface of this collar and not forming a lateral crest on lateral surface of clasper base. Collar erect, not domed, between claspers. Distal corner of clasper bending mesiad around aedeagus, supporting aedeagus in upright position. Claspers sharply curving down and strongly diverging towards apices. Apical part of clasper with sharply edged hollow at its inwardly directed side. Aedeagus (fig. 17) slender and apically rounded in lateral view, strongly Z-curved in apical third, basal two-thirds almost straight. Aedeagus with very slender lateral crests and without dorsal swellings. Aedeagal apex with dorsoventral incision; aedeagus ending in two small and almost pointed lateral lobes (fig. 18).

Measurements: Body length: 29.8 mm; tegmen length: 31.7 mm; head length: 2.3 mm; pronotum length: 2.8 mm; mesonotum length: 6.2 mm; head width: 6.5 mm; width of pronotal collar: 7.2 mm.

Distribution. Endemic to the Cape York Peninsula, Qld. Moulds (1990) recorded the species only known from along the old Leo Creek track at the southern end of the Mellwraith Range, at an altitude of around 300 m.

Remarks. C. fumea is the largest species of this genus and is easily recognized by its distomedially elongated male operculum. *C. fumea* is closely related to *C. suffusa*, described next, sharing a similar colour pattern and incised aedeagal apex. Only one male was available for study.

Chlorocysta suffusa (Distant)

Figures 20–29

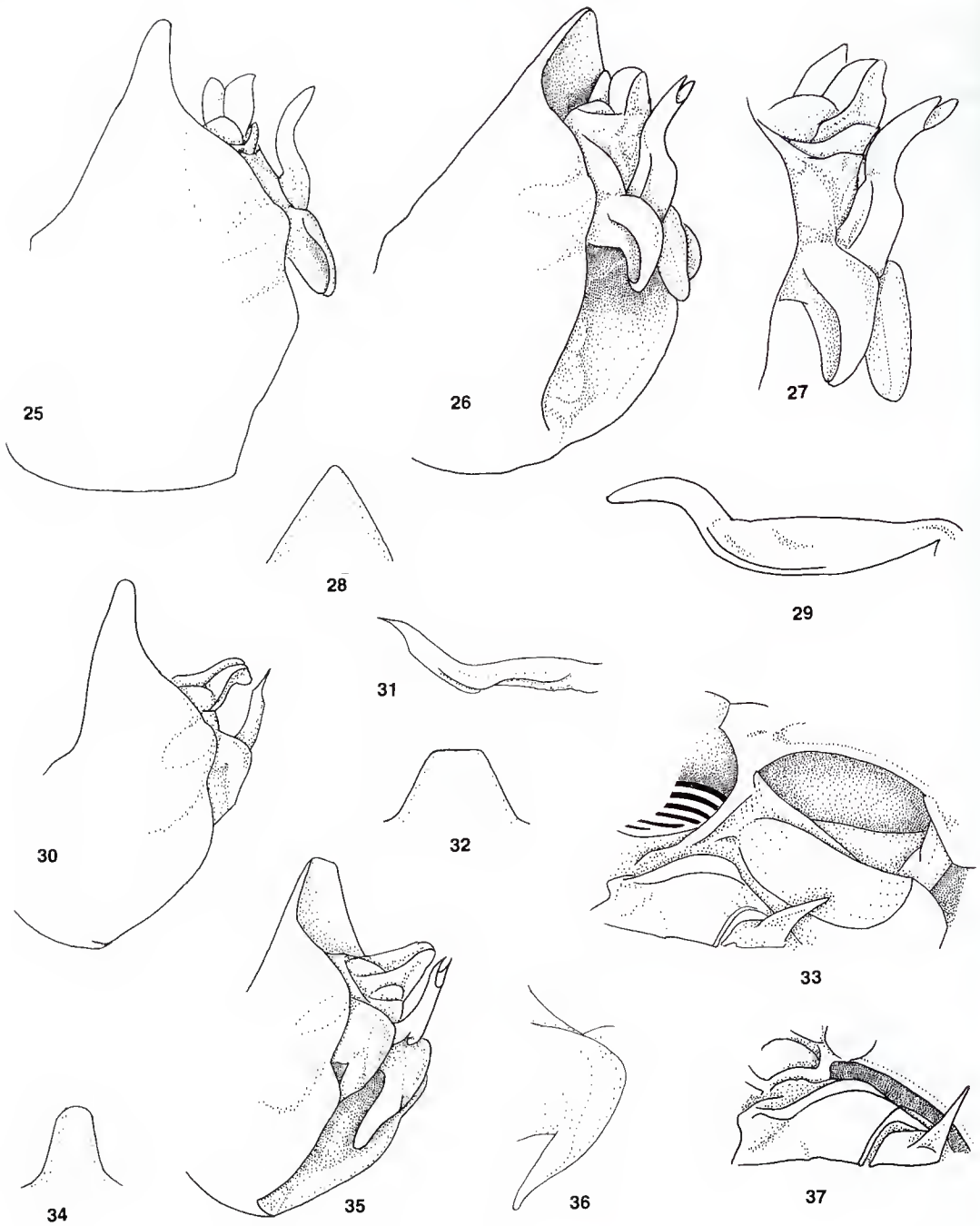
Mardalana suffusa Distant, 1907: 418. — Burns, 1957: 644. — Metcalf, 1963: 258. — Duffels and Van der Laan, 1985: 249.

Chlorocysta suffusa. — Moulds, 1990: 186–187, pl. 22 figs 7, 7a.

Material examined. Australia. S. Qld, Nauklér, coll. Dodd, ♂, ZMH. Cairns 9 km W, ii-iv.1985, ♂, ZMA. Cairns, A.P. Dodd ♂ Det. *Chlorocysta vitripennis* G+F. BPBM. Cairns, 1920, J.F. Illingworth, ♂, ♀ Det. *Chlorocysta vitripennis* G+F, BPBM. Clohesi River, S.F. SW of Kuranda, 18.i.1984, M.S. and B.J. Moulds, ♂ *C. suffusa* det. M.S. Moulds, ♀ *C. suffusa* det. M.S. Moulds. Moul. Gordonvale, J.F. Illingworth, ♂, ♀, BPBM. Julatten, 10.xi.1979, M.S. and B.J. Moulds, ♀ *C. suffusa* det. M.S. Moulds, Moul. Same data but 20.xi.1979, ♂ *C. suffusa* det. M.S. Moulds, Moul. 15.i.1981, ♂ *Mardalana suffusa* det. M.S. Moulds, ZMA. 17.i.1981, ♂ *C. suffusa* det. M.S. Moulds, Moul. 24.i.1981, ♀ *C. suffusa* det. M.S. Moulds, Moul. 13.iii.1982, ♂ *C. suffusa* det. M.S. Moulds, Moul. Kamerunga, nr Cairns, 14.i.1977, M.S. and B.J. Moulds, ♂ *C. suffusa* det. M.S. Moulds, Moul. Kuranda, 200m, 12.iii.1956, J.L. Gressitt, ♂, BPBM. Kuranda, 14.ii.1988, J. Hasenpusch, ♂ *C. suffusa* det. M.S. Moulds, Moul. Quarantine Bay, nr Cooktown, 17.ii.1982, M.S. and B.J. Moulds, ♀ *C. suffusa* det. M.S. Moulds, Moul. Tully Falls, S of Ravenshoe, 11.i.1977, M.S. and B.J. Moulds, ♀ *C. suffusa* det. M.S. Moulds, Moul. Upper Smithfield, nr Cairns, 7.i.1984, M.S. and B.J. Moulds, ♂ *C. suffusa* det. M.S. Moulds, Moul. Windsor Tableland, NW of Mossmann, 10.i.1984, M.S. and B.J. Moulds, ♂ *C. suffusa* det. M.S. Moulds, Moul. Woobadda R., S of Bloomsfield, 13.i.1984, M.S. and B.J. Moulds, ♂ *C. suffusa* det. M.S. Moulds, ♀ *C. suffusa* det. M.S. Moulds, Moul.

Description. Body ochraceous to brown, probably green when alive and covered with short brown hairs (for photographs see Moulds, 1990: pl. 22 figs 7, 7a). Head and thorax with indistinct pattern of brown stripes. Females with conspicuously striped abdomen. Abdomen in males 1.4–1.6 x head and thorax together, in females 1.0–1.2 x. Tegmina of males 1.1–1.2 x body length, of females 1.3–1.4 x.

Head. With similar colour pattern as in *C. fumea*, though strongly varying in intensity. Vertex light brown, darker brown around lateral ocelli and sometimes around frontal ocellus and with dark brown spots bordering lateral corners of postclypeus. Vertex lobe with 2 dark brown spots between lateral ocellus and eye and a dark spot bordering proximomedial corner of eye.



Figures 25–37. 25–29, *Chlorocysta suffusa* Distant, 1907: 25, pygofer in lateral view, Julatten; 26, pygofer in oblique view, Julatten; 27, claspers and aedeagus, Julatten; 28, male caudodorsal beak in dorsal view, Julatten; 29, aedeagus in lateral view, Julatten.
30–37 *Owra insignis* Ashton, 1912: 30, pygofer in lateral view; 31, aedeagus in lateral view; 32, male caudodorsal beak in dorsal view; 33, male operculum; 34, female caudodorsal beak in dorsal view; 35, pygofer in oblique view; 36, clasper; 37, female operculum.

Vertex lobes slightly darkened on anterior parts. Postclypeus in dorsal view dark brown at lateral corners and along anterior margin. Ventral part of postclypeus with large dark medial spot. Lateral surface of postclypeus with 9–10 irregular rows of short parallel ridges continuing into ten parallel streaks running towards central fissure.

Thorax. Pronotum ochraceous brown, with a broad lighter ochraceous coloured medial band that is not, or only slightly, dilating towards distal pronotal margin. Proximal end of this band marked by a pair of small dark brown paramedian spots at pronotal collar. Pronotum light brown along oblique fissures and towards medial band. Mesonotum greyish brown, only slightly darkened in paramedian spots at pronotal margin and in vague reticulate pattern of angular brown spots, forming lateral streaks from pronotal margin to corners of cruciform elevation. Cruciform elevation greenish ochraceous, with brown medial band. 2 black spots in front of elevation.

Tegmina and wings: Hyaline. Tegmen venation variable, differing even between left and right tegmen of individuals. Tegmina with 12–13 apical areas and a, at some places double, band of 6–8 subapical areas. Wings with 5 apical areas.

Tymbals. 12 dark brown parallel sclerotized ridges; 8 ridges spanning the tymbal from dorsal to ventral margin, the 4 most proximal ridges do not reach ventral margin and successively shortening, with most proximal ridge shortest. 12 short and lighter coloured intercalary ridges seem to form a lateral band across tymbal.

Operculum. Male operculum (fig. 24) closely resembling that of *C. fumea* in size, but with a more rectangular shaped distal part, not elongated at distomedial corner. Basal part of operculum slighly vaulted and wedge-shaped; longest medially and tapering towards its lateral margin. Basal part forming a distinct, though very short crest around rectangular distolateral corner. Distal part of operculum almost rectangular, adjacent to body and not covering tymbal cavity in ventral view, though, as in *C. fumea*, covering most of folded membrane. The straight and almost parallel lateral and medial margins both making an almost right angle with straight distal margin. Meracanthus short, not reaching to distal margin of operculum. Female operculum (fig. 21) short, sickle-shaped and erect.

Abdomen. Male abdomen strongly inflated, almost uniformly brown to green coloured, segmental hind margins often darker coloured. Ventrolateral row of slightly darkened spots on segments 3–7. Female abdomen with pattern of broad longitudinal lateral streaks similar as in *Gymnotympana strepitans* (De Boer, 1995a) and a distinct dark brown ventromedial band. Female caudodorsal beak reaching to apex of ovipositor sheaths (fig. 22) and triangular in dorsal view, somewhat swollen to its base and sharply pointed at apex (fig. 23).

Male genitalia. Pygofer in lateral view (fig. 25) short and globularly rounded. Dorsal margin slightly concave, continuous with straight and slender caudodorsal beak. Distal margin slightly convex between beak and lateral protuberance. Ventral margin straight, but forming a rounded corner under lateral protuberance. Ventral margins converging and forming a sharp angle at base of pygofer opening (fig. 26). Caudodorsal beak in dorsal view (fig. 28) short, triangular and pointed or narrowly rounded at apex. Lateral lobe of pygofer curving inwards, forming a triangularly swollen protuberance, which does not extend beyond distal margin of pygofer. Claspers (fig. 27) very similar to *C. fumea*. Clasper base fused to a high and continuous collar around base of anal valves. Dorsal margin of clasper ending in right angle on this collar and not forming a crest on lateral surface of clasper base. Clasper base forming collar around base of anal valves, which abruptly, but slightly, curves inwards between claspers. Claspers forming diverging ridges from dorsal margins to base of anal valves. Distal corner of clasper bending mesiad around aedeagus, supporting aedeagus in upright position. Claspers curving down and strongly diverging towards apices. Apical part of clasper with sharply edged hollow at its inwardly directed side. Aedeagus apically rounded in lateral view (fig. 29), slender and Z-curved in apical third. Basal two-thirds of aedeagus almost straight, with very slender lateral crests and slightly swollen dorsally, at distal ends of lateral crests. Aedeagal apex with dorsoventral incision; aedeagus ending in two small, rounded, lateral lobes (fig. 27).

Measurements (mean ± sd): Body length ♂: 24.2–27.9 mm (26.2 mm ± 1.1), ♀: 20.0–21.5 mm (20.5 mm ± 0.6); tegmen length ♂: 28.2–31.2 mm (30.0 mm ± 1.1), ♀: 26.3–28.3 mm (27.5 mm ± 0.7); head length ♂: 2.1–2.5 mm (2.3 mm), ♀: 1.9–2.5 mm (2.2 mm); pronotum length ♂: 2.5–2.8 mm (2.7 mm), ♀: 2.7–2.8 mm; mesonotum length ♂: 5.4–6.4 mm (5.8 mm), ♀: 4.9–5.6 mm (5.3 mm); head width ♂: 6.0–6.7 mm (6.4 mm), ♀: 6.0–6.6 mm (6.3 mm); width of pronotal

collar ♂: 6.7–7.5 mm (7.0 mm), ♀: 6.6–7.3 mm (6.9 mm).

Distribution. Along the eastern coast of the Cape York Peninsula, Qld. Moulds (1990) recorded the species from Iron Range, the McIlwraith Range near Coen and Cooktown south to the Paluma Range.

Remarks. C. suffusa closely resembles *C. fumea* in tymbal shape and colour pattern but can be easily separated from that species by a dark brown suffused spot on the ventral side of the postclypeus. Males of *C. suffusa* are easily separated from *C. fumea* by their rectangular operculum.

Owra Ashton

Owra Ashton, 1912: 224. — Metcalf, 1963: 252. — Duffels and Van der Laan, 1985: 248. — Moulds, 1990: 184–185. — De Boer, 1992b: 18, 19, 20. — De Boer, 1993a: 16–17. — De Boer, 1993b: 142. — De Boer, 1995a: 8. — De Boer, 1995b: 6.

Type species. Owra insignis Ashton, 1912 (monotypic).

Owra insignis Ashton

Figures 30–37

Owra insignis Ashton, 1912: 224, pl. LI figs 6–6a. — Burns, 1957, 642. — Metcalf, 1963: 252. — Duffels and Van der Laan, 1985: 248. — Moulds, 1990: 185, pl. 22 figs 6, 6a.

Material examined. Australia, Lake Barine, 530 m, 31.i-1.ii.1964, J. Sedlacek, ♀, BPBM; Cairns, A.P. Dodd, ♂ Det. *Chlorocysta macrula* Stål, BPBM.

Description. Body reddish brown but according to Moulds (1990) olive green when alive (for photographs see Moulds, 1990: pl. 22 figs 6, 6a). Abdomen in male 1.5 x head and thorax together, in female 1.0 x. Tegmina of male 1.1 x body length, of female 1.4 x.

Tegmina and wings. Hyaline, venation red-brown and costa bright red. Tegmina with 10 (according to Moulds, 1990, sometimes 9) apical areas and a regular band of 3 or 4 subapical areas. Costal area very broad. Tegmen with very narrow hyaline border along hind margin. Wing with 5 apical areas and broad hyaline border along hind margin.

Tymbals. 5 parallel sclerotized ridges spanning the tymbal from dorsal to ventral margin and a 6th, most proximal ridge, almost reaching ventral margin. 5 distinct intercalary ridges seem to form a lateral band across tymbal.

Opercula. Male operculum (fig. 33) extremely small, not covering tymbal cavity in ventral view and leaving folded membrane completely exposed. Basal part of operculum about 4 x as long as distal part, slightly vaulted and with distinct crest around rectangular distolateral corner. Basal part wedge-shaped; medially distinctly longer than laterally. Distal part of male operculum very short, sickle-shaped and erect, hardly more than a continuation of the crest around distolateral corner of basal part. Meracanthus reaching well beyond operculum. Female operculum (fig. 37) very similar to that of male, with extremely short and sickle-shaped distal part.

Abdomen. Male abdomen slender and weakly inflated, almost unicoloured ochraceous, but segmental hind margins orange-brown. Second tergite (fig. 33) weakly curved along tymbal cavity. Female abdomen light brown with reddish segmental hind margins and ventrolateral row of brown spots on segments 3–8. Ovipositor sheaths not reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view (fig. 34) broad and bluntly rounded at apex.

Male genitalia. Pygofer in lateral view as in fig. 30. Dorsal margin of pygofer straight, strongly concave to base and angularly bending into straight, slender and erect caudodorsal beak. Distal margin slightly convex, angularly bending into margin of beak. Lateral lobe of pygofer strongly curving inwards towards end of distal margin and forming an angularly rounded and swollen lateral protrusion. Ventral margin of pygofer strongly convex near this protrusion, but almost straight towards base of pygofer. Ventral margins converging to short and straight basal margin at base of pygofer opening (fig. 35). Caudodorsal beak in dorsal view (fig. 32) short and broad, truncate at apex. Claspers very different from those of related species, missing a clasper hollow. Clasper (fig. 36) broad, globularly swollen near base, strongly curved down to very slender and elongate, almost laminiform apical part. Claspers strongly diverging towards their truncate apices. Clasper base forming a low collar around base of anal valves. Aedeagus (fig. 31) strongly upcurved at half-length and with slender lateral crests. Aedeagal apex incised, as in *C. fumea* and *C. suffusa*, but ending in two more sharply pointed lateral lobes (fig. 35).

Measurements. Body length ♂: 15.1 mm, ♀: 13.3 mm; tegmen length ♂: 17.0 mm, ♀: 19.0 mm; head length ♂: 1.6 mm, ♀: 1.7 mm; pronotum length ♂: 1.6 mm, ♀: 1.8 mm; mesonotum length ♂: 3.0 mm, ♀: 3.3 mm; head width ♂: 4.1 mm, ♀: 4.6 mm; width of pronotal collar ♂: 4.0 mm, ♀: 4.6 mm.

Distribution. Only known from the south-eastern corner of the Cape York Peninsula, north-eastern Qld. Moulds (1990) recorded the species from Thornton Peak range north of Daintree to Mission Beach and widespread on the Atherton Tableland.

Remarks. Owra insignis is a very small ochraceous brown species, at first sight closely resembling *Guineapsaltria flava* and *Gymnotympana rufa*. *Owra*, however, is closely related to *Chlorocysta* and *Glaucopsaltria*, sharing the presumed synapomorphic tegmen venation. *Owra* shares the 5 apical areas in the wing with *Chlorocysta*. Only one male and one female have been examined.

Glaucopsaltria Goding and Froggatt

Glaucopsaltria Goding and Froggatt, 1904: 657, 659. — Moulds, 1990: 189 — De Boer, 1992b: 18, 19, 20. — De Boer, 1993a: 16–17. — De Boer, 1993b: 142. — De Boer, 1995a: 8. — De Boer, 1995b: 6.

Glaucopsaltria in synonymy of *Chlorocysta*. — Distant, 1906: 159. — Metcalf, 1963: 255–256, 473.

Type species. Glaucopsaltria viridis Goding and Froggatt (monotypie).

Glaucopsaltria viridis Goding and Froggatt

Figures 38–44

Glaucopsaltria viridis Goding and Froggatt, 1904: 566, 658. — Kirkaldy, 1907: 308 (6). — Moulds, 1990: 190, pl. 22 fig 3. — De Boer, 1995a: 16.

Chlorocysta viridis. — Distant, 1906: 159. — Froggatt, 1907: 352. — Burns, 1957, 643. — Metcalf, 1963: 256. — Duffels and Van der Laan, 1985: 249.

Material examined. Australia. Qld. 24.ii.1946, ♂, SEM. Brisbane. 1973, J.B. Vogel, ♂, ZMA. Qld, J.A. Grant, BM- CSIRO Expedition, BM 1973–346, ♂, BMNH. Rockhampton, Museum Godefroy No 4836, ♂ det, *C. viridis*. ZIM.

Description. Body olive green or yellow-green (for photograph see Moulds, 1990: pl. 22 fig 3). Tegmina slightly shorter than body. Abdomen 1.9–2.2 x head and thorax.

Tegmina and wings. Hyaline. Tegmen venation variable and differing even between left and right tegmen of individuals. Tegmina with 13–15 apical areas and a continuous band, at some places consisting of a double row, of 7–10 subapical areas. Costal area very distinct, broadening towards tegmen apex. Tegmen with distinct hyaline border along hind margin, though narrower than in wing. Wing with 6 apical areas.

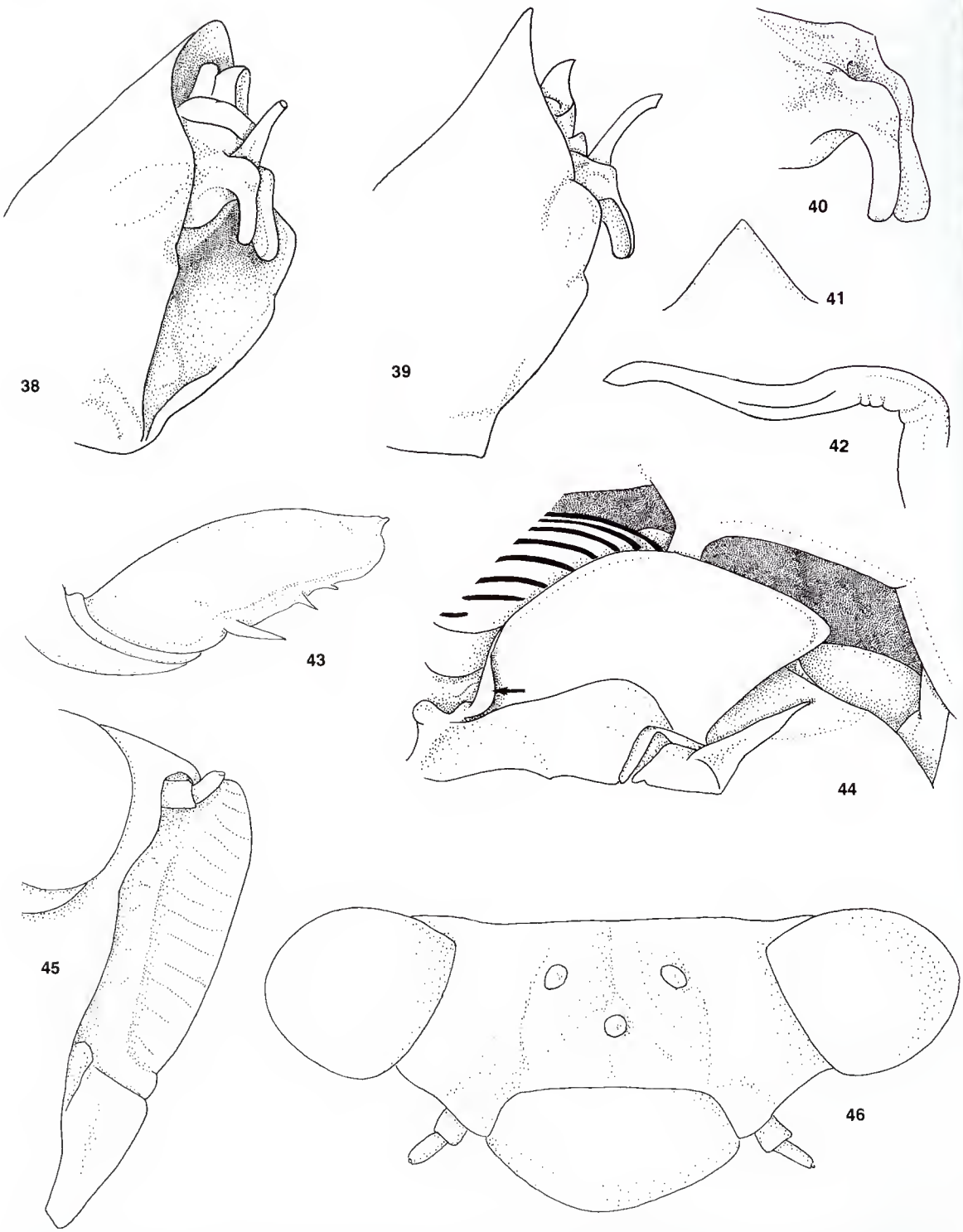
Legs. Fore femur with row of 3 erect spines (fig. 43).

Tymbals. 6 transverse sclerotized ridges spanning the tymbal from dorsal to ventral margin and a 7th, most proximal, ridge almost reaching ventral margin. 7 short intercalary ridges seem to form a lateral band across tymbal.

Opereulum (fig. 44). Basal part of operculum slighly vaulted, wedge-shaped; longest medially and tapering towards lateral margin. Basal part forming an irregularly protruding crest around distolateral corner. Distal part of opereulum longer than basal part and reaching beyond apex of meracanthus. Distal part only partly covering tymbal cavity in ventral view, though covering most of folded membrane. Lateral margin making an almost right angle with basal part of opereulum and initially almost straihgt, but angularly bending mesiad where opereulum curves towards body. Distal margin straight, making a sharp angle with straight medial margin. Distolateral corner broadly rounded. Operculum strongly curved-up along proximal part of its lateral margin (especially in Brisbane specimen), forming a small lobe (fig. 44 arrow).

Abdomen. Strongly inflated, uniformly green or discoloured yellow, with traces of green. Second tergite medially about 3 x 1st tergite and laterally gradually tapering to auditory capsules. Seventh tergite wedge-shaped in lateral view; very long and convex dorsally (lateral view), short ventrally.

Genitalia. Pygofer in lateral view as in fig. 39. Dorsal margin weakly concave, continuous with erect caudodorsal beak. Distal margin weakly convex between beak and lateral protuberance. Ventral margin straight, forming an almost rectangular corner just under lateral protuberance, concavely bent near base of pygofer opening. Ventral margins converge and form a sharp angle at base of pygofer opening (fig. 38). Caudodorsal beak in dorsal view (fig. 41) broad and triangular, almost rectangular at apex. Lateral lobe of pygofer bending inwards towards distal margin, forming an angularly rounded and laterally flattened protuberance. Clasper as in *Chlorocysta*, but with longer and more slender apical part (fig. 40). Apical part of clasper strongly bent down towards smoothly rounded apex and with a sharply edged hollow at inwardly directed side. Dorsodistal corner of clasper bending mesiad around aedeagus, supporting aedeagus in upright position. Claspers almost parallel, only slightly diverging towards apices and fused at base to a fairly low and continuous collar around base of anal valves. Medial part of collar curving inwards, slightly dome-shaped proximally of aedeagus, between



Figures 38–46. 38–44, *Glaucopsaltria viridis* Goding and Froggatt, 1904: 38, pygofer in oblique view, Australia; 39, pygofer in lateral view, Brisbane; 40, claspers, Australia; 41, caudodorsal beak in dorsal view, Australia; 42, aedeagus in lateral view, Australia; 43, male fore femur in lateral view, Australia; 44, operculum, Brisbane, arrow indicating upcurving lateral lobe. 45–46 *Venustria superba* Goding and Froggatt, 1904: 45, male postclypeus in lateral view, Kuranda; 46, male head in dorsal view, Kuranda.

dorsal crests of claspers. Dorsal margin of clasper forming a sharply edged crest, continuing on lateral surface of clasper base. Aedeagus (fig. 42) weakly S-curved, with very short and narrow lateral crests along proximal half. Aedeagal pore oval.

Measurements. (mean): Body length: 29.8–33.8 mm (32.1 mm); tegmen length: 29.5–31.3 mm (30.0 mm); head length: 2.1–2.4 mm (2.3 mm); pronotum length: 2.7–2.9 mm (2.8 mm); mesonotum length: 5.1–6.0 mm (5.5 mm); head width: 6.4–6.5 mm; width of pronotal collar: 6.8–7.0 mm (6.9 mm).

Distribution. Along the eastern coast of Qld and in north-eastern NSW. Moulds (1990) recorded the species from Daintree River punt crossing and Cairns in northern Qld, from Mackay, Carlisle Island, Middle Percy Island and Eungella in central Qld and from the Kolan River north of Gin Gin to Dorrigo.

Remarks. Glaucopsaltria viridis is larger than the *Chlorocysta* species with a strongly inflated abdomen. *Glaucopsaltria* is easily separated from *Chlorocysta* and *Owra*, since it has six (instead of five) apical areas in the wings. Males of *G. viridis* can be recognized by the shape of the 7th tergite which is very long middorsally but short ventrally so that the pygofer is curved to a ventral position. Females have not been examined. The local name of this species is Bottle Cicada (Moulds, 1990).

Venustria Goding and Froggat

Venustria Goding and Froggatt, 1904: 565, 596. — Distant, 1906: 128, 129. — Metcalf, 1963: 203. — Duffels and Van der Laan, 1985: 233. — Moulds, 1990: 32, 180. — De Boer, 1990: 64. — De Boer, 1991: 2–3. — De Boer, 1992a: 164. — De Boer, 1992b: 19. — De Boer, 1993a: 16–17. — De Boer, 1993b: 142. — De Boer, 1994a: 3. — De Boer, 1994b: 130. — De Boer, 1995a: 1, 3, 4, 8, 11. — De Boer, 1995b: 5.

Venustra [sic]. — Kato, 1932: 181.

Type species. Venustria superba Goding and Froggatt, 1904 (monotypic).

Remarks. Distant (1906) included *Venustria* in his division Taphuriaria (now the tribe Taphurini, which has as principal characters: "Eyes projecting beyond anterior margin of pronotum; pronotum subquadrate, not distinctly narrowed anteriorly; abdomen about as long as space between apex of head and base of cruciform elevation; a more or less distinct posterior metasternal process visible in males between or at the base of the opercula" (Distant, 1906). Recently Moulds (1990) transferred the genus to Chlorocystini since several characters (e.g., forewing vein Sc separated from costa; apical cells mostly longer than ulnar cells; and an inflated male abdomen) are "associated with that tribe".

Venustria has a weakly S-curved aedeagus, with very narrow lateral crests and should therefore be placed in Chlorocystini. The width of the head and shape of the pronotum of *Venustria* are very similar to those of *Chlorocysta* and its metasternum, though more protruding than in *Chlorocysta*, does not differ greatly from that of other genera of the tribe. Males of *Venustria*, however, have a very short and rather solid looking abdomen, often shorter than head and thorax together. The eyes are large and angular with inwardly directed proxomedial corners and the tegmina are relatively long so that in general aspect *Venustria* looks fairly different from all other species of the tribe.

Venustria superba Goding and Froggatt

Figures 45–55

Venustria superba Goding and Froggatt, 1904: 565, 597, 603, pl. xix figs 7, 7a. — Distant, 1906: 628. — Burns, 1957: 634. — Metcalf, 1963: 203–204. — Duffels and Van der Laan, 1985: 233. — Moulds, 1990: 180–181, pl. 16, fig. 11. — De Boer, 1995a: 3, 4, 9, 13, 15, 74, 77.

Material. Australia. Australiën, 1888, v Müller, ♀, SMN. Etty Bay nr Innisfail, 23.ii.1982, M.S. and B.J. Moulds, ♂ *Venustria superba* det. M.S. Moulds, ZMA. Cairns, J.F. Illingworth, 1920, 5♂, ♀ det. *Venustria superba*, BPBM. Kuranda 1 ml. E, 11.iii.1964, I.F.B. Common and M.S. Upton, ♂, CSIRO.

Description. Body light brown (for photograph see Moulds, 1990: pl. 16, fig. 11). Females about as long as males, but with more robust head and thorax and longer tegmina. Abdomen of males relatively short, 0.8–1.1 × head and thorax together, of females 0.9–1.0 ×. Tegmina fairly long in males and females, being 1.3–1.5 × body length.

Head (fig. 46): Ochraceous brown, darkened towards anterior margins of vertex lobes, with row of 3 dark spots on vertex lobe between lateral ocellus and eye. Head slightly broader than anterior part of pronotum, 2.4–3.1 × as broad as long and 2.1–2.4 × as broad as distance between eyes. Head distinctly shorter than distance between eyes. Postclypeus 2.6–3.2 × as wide as long and smoothly rounded anteriorly, its anterior margin convex and almost continuous with anterior margins of vertex lobes.

Figures 47–55. *Venustria superba* Goding and Froggatt, 1904: 47, female genital segment, Cairns; 48, female operculum, Cairns; 49, female caudodorsal beak in dorsal view, Cairns; 50, pygofer in lateral view, Kuranda; 51, pygofer in oblique view, Kuranda; 52, aedeagus in lateral view, Etty Bay; 53, male caudodorsal beak in dorsal view, Kuranda; 54, male fore femur in lateral view, Kuranda; 55, male operculum, Etty Bay.

Postclypeus (fig. 45) weakly swollen ventrally, anterior margin (lateral view) weakly convex. Lateral sides of postclypeus with about 12 furrows and 5–6 very short and irregular rows of short parallel ridges on weakly inflated crest along the lorum. Vertex smooth with weak medial furrow and without diverging furrows. Vertex in males 1.8–2.2 x, in female 2.3–2.4 × as wide as long and, in both sexes, 1.4–1.8 × as wide as width of eye. Eyes large and angular; medial margins of eyes strongly converging; shortest distance between eyes at their proxomedial corners. Ocelli small and wide apart. Distance between lateral ocelli 0.8–1.0 × distance between lateral ocellus and eye and 2.8–3.4 × width of frontal ocellus.

Thorax. Pronotum ochraceous, with dark streaks in and along oblique fissures and a narrow light ochraceous or greenish coloured medial band bordered by vaguely darkened streaks. Pronotum without medial fissure, 2.3–2.7 × as wide as long and, across the collar, 1.1–1.2 × as wide as head. Amplified lateral corners of pronotal collar larger than in *Chlorocysta*. Mesonotum ochraceous brown, with reticulate pattern of ochraceous stripes and brown specks, forming a pair of paramedian semicircular spots at pronotal margin and a pair of converging lateral bands from pronotal margin to corners of cruciform elevation. 2 dark spots in front of cruciform elevation.

Legs. Fore femur (fig. 54) with row of 3 erect spines, diminishing in length towards tibia. Most proximal spine very long, longer than distance to middle spine.

Tegmina and wings. Hyaline, but slightly bronzed in apical areas. Venation reddish brown. Tegmen with 9 apical areas and distinct costal area. Veins CuA and M adjacent, but not fused near basal area. Wing with 6 apical areas.

Tymbals. 4 transverse sclerotized ridges spanning the tymbal from dorsal to ventral margin, a 5th ridge almost reaching ventral margin and a 6th, most proximal, ridge spanning about three-quarters of tymbal width. 5 short intercalary ridges seem to form a lateral band across tymbal.

Opercula. Male operculum (fig. 55) covering greater part of tymbal cavity in ventral view and extending medially of meracanthus. Basal part of operculum medially distinctly longer than laterally, abruptly broadening at about third of its width and strongly vaulted. Distal part angularly oblong. Lateral margin long and straight, angularly bent into weakly convex distal margin. Distomedial and medial margins straight, distomedial corner broadly rounded, medial corner more narrowly rounded, almost rectangular. Meracanthus very short, hardly reaching beyond basal part of operculum. Opercula widely separated medially. Female operculum (fig. 48) very small. Basal part as in males, medially distinctly longer than laterally. Distal part shorter than basal part, its straight lateral margin forming a broadly rounded angle with weakly convex distal margin.

Abdomen. Light brown, silvery pilose and with dark brown midventral band. Males with darkened 8th and sometimes 7th, tergite and ventrolateral row of slightly darkened spots on segments 3–7. Male abdomen more solid in aspect than in other species of Chlorocystini, hardly swollen and almost without fold between tergites and sternites; nearly circular in cross section. First tergite very short and partly hidden under metanotum. Anterior margin of 2nd tergite concave medially. Lateral parts of 2nd tergite swollen anteriorly and almost adjacent to tymbal, leaving only a narrow gap between tymbal and 2nd tergite. Auditory capsules globularly swollen and distinctly elevated relative to connecting bar between abdomen and tymbal. Tergite part between auditory capsule and sternite 2 almost straight, with distinct crest along tymbal cavity. First sternite globularly swollen between opercula. Female abdomen about as large as that of male, but more strongly tapering towards apex. Female pygofer (fig. 47) long and slender with distinct thorn-shaped protuberance at ventral margin. Ovipositor sheaths reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view (fig. 49) triangular and sharply pointed at apex.

Male genitalia. Pygofer in lateral view as in fig. 50. Dorsal margin almost straight, but concave to base and weakly convexly bent into stout and slightly posteriorly curved caudodorsal beak. Distal margin angularly convex, concavely bent into caudodorsal beak and ending in almost right angle on broad and angular lateral protrusion. Ventral margin strongly concave. Lateral lobe of pygofer with very small angularly swollen lateral protuberance, distinctly reaching beyond distal margin of pygofer. Pygofer opening broad (fig. 51); ventral margins ending wide apart at straight basal margin. Caudodorsal beak in dorsal view (fig. 53) triangular and sharply pointed at apex. Clasper (cf. fig. 51) very short and stout, with rounded lobate and downwardly directed apical part and broad, sharply edged inwardly directed, clasper hollow. Dorsal

margin of clasper sharply curving upwards proximally, merging with broad ring-shaped clasper base. Basal part of clasper very broad in lateral view, distinctly swollen around base of anal valves, especially mid-between claspers, possibly representing the remnants of a medial uncus lobe. Aedeagus (fig. 52) weakly S-curved, strongly swollen in proximal half and curving down towards apex. Aedeagus strongly widening near base, forming 2, somewhat lobate, basolateral protuberances flanking a large hollow at the fold between aedeagus and its basal plate. These protuberances continue into short lateral crests along proximal part of aedeagus. Aedeagus with very slender, almost membranous, laminiform ventrolateral crests, just medially of these lateral crests, which curve into the ventral hollow between the basolateral protuberances. Aedeagal pore almost round, weakly incised ventrally.

Measurements (mean ± sd): Body length ♂: 20.6–25.2 mm ($\bar{x}$23.4 mm ± 1.3), ♀: 23.4 and 26.2 mm; tegmen length ♂: 31.0–34.6 mm ($\bar{x}$33.5 mm ± 1.1), ♀: 35.1 and 35.3 mm; head length ♂: 2.4–3.1 mm ($\bar{x}$2.6 mm), ♀: 2.5 and 2.6 mm; pronotum length ♂: 2.9–3.6 mm ($\bar{x}$3.3 mm), ♀: 3.4 and 3.7 mm; mesonotum length ♂: 6.0–7.8 mm ($\bar{x}$7.0 mm), ♀: 6.8 and 8.0 mm; head width ♂: 6.7–7.7 mm ($\bar{x}$7.5 mm), ♀: 8.0 and 8.1 mm; width of pronotal collar ♂: 7.6–8.8 mm (8.5 mm), ♀: 8.8 and 9.2 mm.

Distribution. Endemic to the south-eastern corner of the Cape York Peninsula, north-eastern Qld. Moulds (1990) recorded the species from Mt Hartley approximately 30 km south of Cooktown to the Kirrama Range north-west of Cardwell.

Remarks. The species can be recognized by slightly bronzed tegmina with 9 apical areas. Males are characterised by short lobate claspers and females are easily recognized by the sharp, thorn-shaped, protuberance at the ventral margins of the pygofer (fig. 47). The local name of this species is Frog Cicada (Moulds, 1990).

Cystosoma and *Cystopsaltria*

Description. Body reddish brown, without any distinct colour markings. Surface of head and pronotum roughly wrinkled and pitted. Head and pronotum conically shaped; anterior margins of postelypeus and vertex lobes forming an almost continuous straight line with lateral margin of pronotum, though interrupted by eyes. Females smaller than males. Abdomen of males strongly inflated, being 1.3–2.0 × head and thorax, in females 0.9–1.1 ×. Male tegmen in *Cystosoma* 0.8–1.1 ×, in *Cystopsaltria* 1.4 × body length, in females 1.2–1.4 ×. Head (fig. 69) narrower than anterior part of pronotum, with long and angularly protruding postclypeus. Head 1.9–2.3 × as broad as long. Postclypeus distinctly protruding, its sharply edged anterior margin forming a right angle at apex. Postclypeus 1.6–2.1 × as broad as long, distinctly swollen ventrally (fig. 70), its anterior margin (lateral view) convex or forming an obtuse angle at half length. Lateral sides of postelypeus sometimes slightly bulbous, with about 9–12 weak furrows and a weakly inflated crest along lorum. Vertex wrinkled, with distinct medial fissure, but without diverging fissures between ocelli. Central part of vertex only slightly elevated, often even somewhat pressed down and concave. Vertex in *Cystopsaltria* narrower than in *Cystosoma*. Vertex 1.6–2.1 × as broad as long. Distance between eyes 0.9–1.1 × length of head and 1.1–1.4 × postelypeus width. Ocelli wide apart in *Cystosoma*, more closely together in *Cystopsaltria*. Distance between lateral ocelli 0.8–1.1 × distance between lateral ocellus and eye, and, in *Cystosoma* 2.4–3.7 ×, in *Cystopsaltria* 1.9–2.2 × width of frontal ocellus. Pronotum with grooved and pitted surface and distinct medial furrow. Amplified lateral corners of pronotal collar forming an inflated crest along anterior margin, which is continuous with the sharply edged anterolateral margin of pronotum. Mesonotum with a more smooth surface and with very narrow cruciform elevation, narrower than long across its centre. Fore femur (fig. 60) with row of 3 spines, diminishing in length towards tibia, most proximal spine strongly bent and adjacent to femur, reaching to about half-way the distance to middle spine (see arrow). Tegmina green, opaque rusty brown or greenish tinged in museum material, fairly slender and pointed at apex. Venation reticulate in distal half of tegmen. This reticulation includes ulnar areas in *Cystopsaltria*, but *Cystosoma* has normally developed ulnar areas. Costal area and border along hind margin of tegmen very narrow. Wings hyaline, in *Cystosoma* with 7–10, in *Cystopsaltria* with 12–14 apical areas, often somewhat reticulate near wing apex and with fairly broad hyaline border along hind margin. Tymbal with 6–10 transverse sclerotized ridges from dorsal to ventral margin. Male opercular fairly small. Basal part of operculum hardly vaulted, but in males forming a large, often globularly swollen, protuberance at distolateral corner. Distal part of male operculum angularly

oblong, curved to close against the body and covering most of tymbal cavity in ventral view. Opercula widely separated medially, by broad and rounded first sternite. Meracanthus short, not reaching distal margin of operculum. Female operculum shorter than that of male, with a more elongate lateral crest of basal part. Male abdomen very delicate and strongly inflated, without distinct folds between tergites and sternites; almost circular in cross section. First tergite in male fairly long, not hidden under metanotum. Proximal margin of second tergite convex medially and almost straight between auditory capsules and sternite 2 in *Cystosoma* (fig. 68), though weakly curved in *Cystopsaltria* (fig. 82) and forming a fairly distinct ridge along tymbal cavity. Lateral parts of 2nd tergite weakly swollen at anterior margins and adjacent to tymbals. Sternites 1 and 2 adjacent. Auditory capsules in males weakly developed, hardly protruding, but distinctly elevated relative to connecting bar between tymbal and abdomen. Female abdomen more robust than that of male, but much smaller with short and broad genital segment. Ovipositor sheaths not reaching to apex of bluntly rounded caudodorsal beak (fig. 63). Male pygofer globularly rounded, with short caudodorsal beak. Beak not curved over basal part of claspers or anal valves. Lateral lobes of pygofer curved inwards and forming bluntly rounded lateral protuberances. Claspers broad at base and hook-shaped; sharply curving down at half-length. Apical part of clasper with large, sharply edged, clasper hollow. Claspers weakly diverging towards rounded apices. Basal parts of claspers forming a continuous but very low ring-shaped collar around base of anal valves. Aedeagus weakly S-curved. Aedeagal pore round.

Tribal placement. Distant (1905) included *Cystosoma* in his division Hemidictyaria (presently tribe Hemidictyini) which has as its principal character a narrow head. This division also contained *Hemidictya* Burmeister, 1835, *Hovana* Distant, 1905 and seven genera that were later brought into the tribe Prasiini (e.g., *Arfaka* Distant, 1905; *Iruana* Distant, 1905; *Jacatra* Distant, 1905; *Lacetas* Karsch, 1890; *Lembeja* Distant, 1905; *Prasia* Stål, 1863 and *Sapantanga* Distant, 1905). Recently Moulds (1990) transferred *Cystopsaltria* from Chlorocystini to Hemidictyini based on the narrow head, inflated male abdomen and reticulate tegmina, characters very similar to *Cystosoma*.

A study of male genitalia, however, shows that *Cystosoma* and *Cystopsaltria* should be attributed to Chlorocystini (sensu stricto). *Cystosoma* and *Cystopsaltria* have a weakly S- curved aedeagus with winged lateral crests, the synapomorphy of that tribe. The shapes of pygofer and claspers also agree with such an allocation. Furthermore, for the discriminating characters used by Moulds, the inflated male abdomen of *Cystosoma* and *Cystopsaltria* is larger but otherwise very similar to that of most species of Chlorocystini and different from that of *Hemidictya*, and the head of *Cystosoma* and *Cystopsaltria* is not as notably different as that of several other genera of Chlorocystini.

Hemidictya frondosa Burmeister, 1835 and *Hovana distanti* (Brancsik, 1893), the two remaining species of the Hemidictyini, are undoubtedly closely related and probably sister species, interesting from a biogeographical point of view, since the former comes from Brazil and the latter from Madagascar. These two are characterised by (1) very broad, opaque yellow-green and apically pointed tegmina with reticulate venation in the distal halves, (2) a costa strongly widened and flattened in its proximal half, (3) a distally elongate and sharply pointed mesonotum reaching to the 2nd abdominal segment, and (4) a strongly streamlined head and pronotum, with anterior margins of postclypeus and vertex lobes forming a nearly straight and almost continuous line with margins of the eyes and lateral edges of pronotum. The last character is also found in the African genus *Lacetas* indicating that *Lacetas* should possibly be included in Hemidictyini.

Cystosoma and *Cystopsaltria* share opaque apically pointed and reticulate tegmina and a sharp lateral edge of the pronotum with *Hemidictya* and *Hovana*. Whether reticulate tegmen venation can be regarded synapomorphic is difficult to decide since its extent varies between the four genera. However, in general aspect the tegmina of *Hemidictya* and *Hovana* are very different from those of *Cystosoma* and *Cystopsaltria*. Tegmina of the former two are broader, more squarish and have a widened costa, while the veins CuA and M fuse well before reaching the basal area.

The sharp lateral edge of pronotum is definitely different, sharper, in *Hemidictya* and *Hovana*. Head and pronotum of these two species are more strongly streamlined than in *Cystosoma* and *Cystopsaltria*; even the eyes are flattened and contribute to this streamline. A lateral pronotum edge similar as in *Cystosoma* and *Cystopsaltria* was found in several other species of Chlorocystini (e.g., *Mirabilopsaltria*

viridicata (Distant, 1897), *M. humilis* (Blöte, 1960), *Gymnotympana montana* De Boer, 1995, *G. olivacea* Distant, 1905 and *G. verlaani* De Boer, 1995; see De Boer, 1995a; De Boer, 1995b, 1996).

Study of male genitalia of *Hemidictya frondosa* (unpublished) does not suggest relationship to Chlorocystini since there are considerable differences in shapes of pygofer, clasper and aedeagus between species of that tribe.

Monophyly. Cystosoma and *Cystopsaltria* are easily recognized by the following synapomorphies: apically pointed tegmina and venation reticulate in the distal halves of tegmina (1 and 2 in fig. 56). The hyaline wings too, tend to be somewhat reticulate towards their apices and have more than 6 apical areas. The species further share: 1, a very stout and angularly protruding postclypeus, in lateral view not unlike that of *Thaumastopsaltria*, but more strongly protruding and often with convexly swollen sides; 2, a sharp lateral edge of the pronotum in dorsal view, though interrupted by the eyes, almost continuous with the anterior margins of postclypeus and vertex lobes; and 3, a very slender cruciform elevation on the mesonotum, narrower than long across the centre. These characters also occur in Prasiini, the presumed sister group of Chlorocystini and might therefore be plesiomorphic.

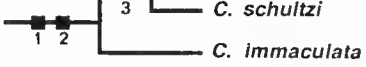


Figure 56. Cladogram of the species of *Cystosoma* and *Cystopsaltria*. Numbers refer to apomorphies discussed in the text.

Phylogeny. Although *Cystosoma schultzi* and *Cystopsaltria immaculata* share a fairly large male opercular, other characters indicate that *Cystosoma schultzi* and *Cystosoma saundersii* form a monophyletic group. The *Cystosoma* species have, compared to *Cystopsaltria*, a distinctly broader pygofer opening and a similar pattern of reticulation in the tegmina more restricted to the apical parts of tegmen. Furthermore, the veins CuA and M fuse at the corner of the basal area in *Cystosoma* (fig. 72), a probable synapomorphy for the two species of that genus (3 in fig. 56).

Cystosoma Westwood

Cicada Westwood, 1842: 118.

Cystosoma Westwood, 1842: 118. — Goding and Froggatt, 1904: 566, 595, 662. — Distant, 1906: 182, 185. — Metcalf, 1963: 433–434. — Boulard, 1979: 46. — De Jong, 1982: 182. — Duffels and Van der Laan, 1985: 315. — Moulds, 1990: 192. — De Boer, 1990: 64. — De Boer, 1992a: 164. — De Boer, 1992b: 18, 19. — De Boer, 1993a: 16–17. — De Boer, 1993b: 142. — De Boer, 1995a: 8, 12, 16. — De Boer, 1995b: 3.

Type species. Cystosoma saundersii Westwood, 1842.

Diagnosis. Head with flattened vertex and large, angularly protruding, postclypeus. Pronotum with distinct medial fissure and rough, pitted, surface. Tegmina opaque green, apically pointed. Tegmen venation reticulate, with many cross veins in apical areas, ulnar areas of normal shape. Veins CuA and M fusing at corner of basal area. Male abdomen strongly inflated.

Remarks. Cystosoma is presumed to be monophyletic, the fusion of the veins CuA and M at the corner of the basal area is the supposed apomorphy for the genus.

Cystosoma saundersii Westwood

Figures 57–68

Cicada saundersii Westwood, 1842: 118.

Cystosoma saundersii. — Westwood, 1842: 118. — Goding and Froggatt, 1904: 566, 662, 663. — Distant, 1906: 185. — Burns, 1957: 670. — Metcalf, 1963: 435. — Duffels and Van der Laan, 1985: 315. — Moulds, 1990: 193–196, pl. 23 figs 1, 1a–b. — De Boer, 1995b: 5.

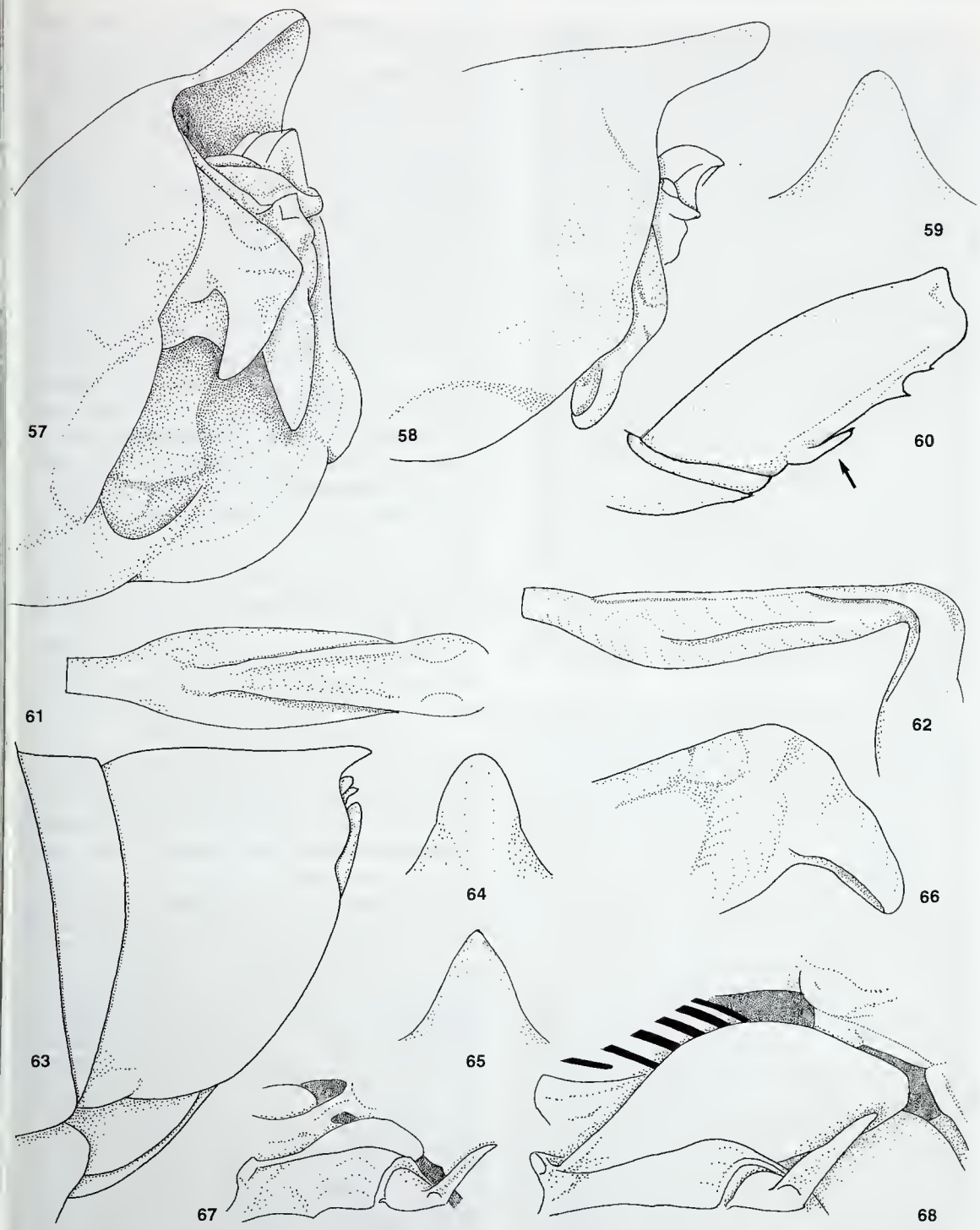
Cytosoma [sic] *saundersii.* — Musgrave, 1953: 13, 1 fig.

Cystosoma laundersii [sic]. — Schremmer, 1957: 19, Fig. 11, 46.

Material examined. Australia. Australia, Saunders, ♂, ♂ *Cystosoma saundersii* det. Edm. Schmidt, IZW. Brisbane, 1973, J.B. Vogel, 3♂, ZMA; Brisbane, Kenmore, xii.1972, J.B. Vogel, 3♂, ♀, ZMA. Cairns, 9 km W., ii-iv.1985, ♀, ZMA. Cunninghams Gap, 700–750 m, 20–30.xi.1963, J.L. Gressitt, ♂, ♀, BPBM. N. Holland, Koch, ♂, ♂ det. *Cystosoma saundersii* Westwood, ZMB. Nov. Holl., (Koch), v. Heyden, ♂ *Cystosoma saundersii* det. R.M. de Jong, SMF. NS Wales, 1908, coll. A. Jacobi, ♂, SMD; Qld, E.H.F. Walter, ♀, BPBM. Richmond river, NS Wales, 1908, Coll. A. Jacobi, ♂, SMD. Tully, New Holland, Camille van Voixem, ♂ det *Cystosoma saundersii* Westw., KBIN. Without locality label: Coll. Camille van Voixem, ♂, KBIN. Jocoli det. Coll. Breddin, ♂, DEI; ♂ *Cystosoma saundersii* det. R.M. de Jong, SMF. Without labels: ♂, ZMB.

Description. Body yellowish brown but green when alive, unmarked (for photograph see Moulds, 1990: plate 23 Figs 1, 1a-b). Abdomen in males 1.7–2.0 × head and thorax together, in females 0.9–1.1 ×. Tegmina of males 0.8–1.0 × body length, of females 1.2–1.3 ×.

Head. Greyish brown. Medial part of vertex hardly elevated, ocelli somewhat pressed



Figures 57–68. *Cystosoma saundersii* Westwood, 1842: 57, pygofer in oblique view, Tully; 58, pygofer in lateral view, Tully; 59, male caudodorsal beak in dorsal view, Tully; 60, male fore femur in lateral view, Tully, arrow indicating strongly bent proximal spine; 61, aedeagus in dorsal view, Brisbane; 62, aedeagus in lateral view, Brisbane; 63, female genital segment in lateral view, Cunningham's Gap; 64, female caudodorsal beak in dorsal view, Cunningham's Gap; 65, female caudodorsal beak in dorsal view, Brisbane; 66, clasper, Tully; 67, female operculum, Brisbane; 68, male operculum, Tully.

inward. Surfaces of vertex and dorsal part of postclypeus very rough, covered with small pits, anterior parts of vertex lobes wrinkled. Vertex and postclypeus with distinct medial fissure. Vertex with semicircular furrow around frontal ocellus, but without diverging fissures between ocelli. Postclypeus distinctly swollen ventrally, anterior margin (lateral view) angularly convex at about half-length. Sides of postclypeus with 11 weak furrows and a smooth and narrow, weakly inflated, crest along lorum.

Thorax, Pronotum pitted, smooth in medial furrow and with long wrinkles across collar. Mesonotum smooth and unmarked.

Tegmina and wings: Tegmina opaque green-brown and pointed at apex. Basal half of tegmen, including ulnar areas, with regular venation, distal half of tegmen reticulate, with many cross veins. Veins M and CuA fused at, or very close to, corner of basal area (cf. fig. 81). Wings hyaline, with irregular venation, 7 or 8 apical areas and 2 or 3 subapical areas. Apex of wing tending to be reticulate, with several cross veins in 1st, 2nd and sometimes 3rd apical area.

Legs, Fore femur (fig. 60) with 3 spines, most proximal spine strongly bent, adjacent to femur.

Tymbals, Large, in lateral view covering more than half of body width. 5 transverse sclerotized ridges spanning the tymbal from dorsal to ventral margin and a 6th most proximal ridge spanning about three-quarters of tymbal width. 6 distinct intercalary ridges form a lateral band across tymbal.

Opercula, Male operculum (fig. 68). Basal part of operculum with a knobby lateral protuberance at distolateral corner and weakly vaulted, lateral vaulting almost absent. Distal part of operculum rather large relative to basal part, almost as long as wide and almost completely covering tymbal cavity in ventral view. Distomedial corner of operculum extending medially beyond meracanthus. Lateral margin long, running straight to base of protuberance at distolateral corner of basal part and convexly bent into straight and about equally long, distal margin. Distomedial corner blunt, medial margin straight and slightly directed mesiad. Meracanthus reaching to about three-quarters of operculum length. Female operculum (fig. 67) narrower and much shorter than in male. Basal part of female operculum about as long as in male, but more distinctly vaulted and with long and distinct crest along rectangular distolateral corner. Distal part very short and erect, oblong, with almost rectangular distomedial corner and broadly rounded distolateral corner.

Abdomen. Ochraceous or green and unmarked. Male abdomen strongly, almost globularly inflated, distinctly broader than thorax and strongly convex dorsally; higher than thorax in lateral view. First tergite not extending under metanotum, more than half as long as 2nd tergite middorsally. Auditory capsules weakly inflated but distinctly elevated relative to connecting bar between tymbal and abdomen. Tymbal cavity very narrow; auditory capsules fairly close together and tergite part between auditory capsule and 2nd sternite very short. Second tergite straight between auditory capsule and 2nd sternite and forming a fairly distinct crest along tymbal cavity. Female abdomen long and slender, with conically protruding auditory capsules. Female pygofer (fig. 63) short and weakly swollen, in lateral view with weakly convex dorsal margin. Ovipositor sheaths not reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view swollen triangular and pointed at apex (fig. 65) but rounded in specimen from Cunningham's Gap, southern Qld (fig. 64).

Male genitalia. Pygofer in lateral view as in fig. 58. Dorsal margin weakly convex, almost straight, continuous with straight caudodorsal beak. Distal margin weakly convex, concavely bent into straight margin of beak. Lateral lobe of pygofer slightly curving inwards and forming a weakly developed, slightly swollen and rounded lateral protuberance. Ventral margin forming a broad and rounded corner just below this protuberance and angularly convex, but concave towards pygofer base. Pygofer globularly swollen; pygofer opening very broad, broadest between lateral protuberances of pygofer lobes, ventral margins of pygofer converging to a convex basal margin at base of pygofer opening; ventral part of pygofer opening broadly U-shaped (fig. 57). Caudodorsal beak in dorsal view (fig. 59) very stout and broadly rounded at apex. Clasper (fig. 66) broad, square-shaped at base, with stout triangular, downwardly directed apical part, curving inwards distally of aedeagus and forming an angular dorsodistal corner supporting aedeagus in upright position. Claspers strongly diverging towards rounded apices. Apical part of clasper with distinct, sharply edged clasper hollow. Aedeagus (fig. 62) very stout and almost straight, slightly swollen and weakly upcurved at three-quarters of its length, but recurving towards apex. Aedeagus with very slender lateral crests and a pair of broad and

rounded dorsal ridges (fig. 61). Aedeagal pore broad and rounded.

Measurements (mean ± sd): Body length ♂: 42.0–51.0 mm (47.2 mm ± 2.6), ♀: 30.0–33.8 mm (31.3 mm ± 1.4); tegmen length ♂: 40.3–47.8 mm (43.9 mm ± 2.4), ♀: 37.7–42.2 mm (40.2 mm ± 1.7); head length ♂: 3.2–3.9 mm (3.5 mm), ♀: 3.4–3.9 mm (3.6 mm); pronotum length ♂: 4.2–4.8 mm (4.6 mm), ♀: 4.2–4.5 mm (4.4 mm); mesonotum length ♂: 7.0–8.3 mm (7.8 mm), ♀: 6.6–8.1 mm (7.4 mm); head width ♂: 7.1–7.8 mm (7.5 mm), ♀: 6.8–7.8 mm (7.4 mm); width of pronotal collar ♂: 10.8–11.9 mm (11.4 mm), ♀: 9.7–11.5 mm (10.7 mm).

Distribution. Eastern Qld and north-eastern NSW. Moulds (1990) recorded the species from the Atherton Tableland in northern Qld, the Clarke Range, Eungella plateau and Mackay in Central Qld, inland at Carnarvon Range and from Kroombit Tops in southern Qld to Sydney.

Remarks. Cystosoma saundersii is the largest species of Chlorocystini, easily recognized by its enormously inflated abdomen, hence the local name "Bladder Cicada" (Moulds, 1990).

Cystosoma schmeltzi Distant

Figures 69–71, 73–75, 81

Cystosoma schmeltzi Distant, 1882: 32, pl. vii figs 11, 11a-b. — Goding and Froggatt, 1904: 566: 662, 664. — Distant, 1906: 185. — Burns, 1957; 670. — Metcalf, 1963: 436. — Duffels and Van der Laan, 1985: 316. — Moulds, 1990: 192–193, pl. 23 figs 2, 2a.

Material. Australia. Dama, Cape York, ♀, ZMB; Gayndah, Mus Godefroy No 17630, ♀ paratype, ZIM. Waeol, 28.ii.1970, H. Sas, ♂, RMNH.

Description. Body yellow-green but green when alive and unmarked (for photographs see Moulds, 1990: pl. 23 figs 2, 2a). Male abdomen 1.4 × head and thorax together, in females 0.9–1.0 x. Tegmina of male 1.0 × body length, of females 1.4 x.

Head (fig. 69): Ochraceous with traces of olive green, vertex lobe with blackish spot between eye and lateral ocellus. Head heavily wrinkled between ocelli and on anterior parts of vertex lobes, vertex with distinct medial fissure. Postclypeus distinctly swollen ventrally, anterior margin (lateral view) angularly convex at about half-length. Lateral parts of postclypeus with 11 weak furrows and a smooth and narrow, weakly inflated, crest along lorum (fig. 70).

Thorax. Pronotum pitted as in *C. saundersii*, smooth in medial furrow and with long wrinkles on collar. Mesonotum smooth and unmarked.

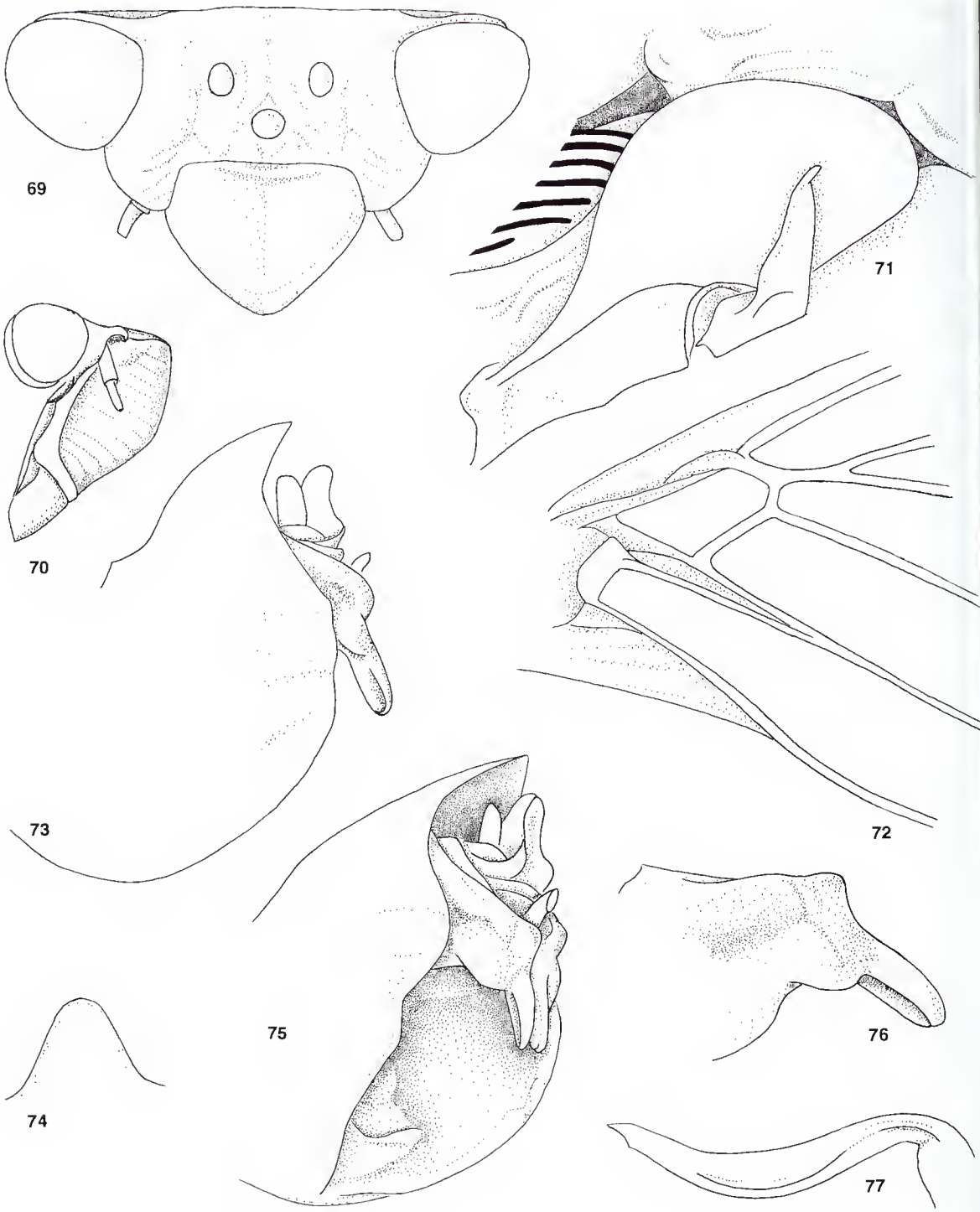
Tegmina and wings: Tegmina opaque green-brown and pointed at apex. Basal half of tegmen, including ulnar areas, with regular venation, apical half reticulate, with many cross veins. Veins M and CuA fused at corner of basal area (fig. 81). Wings hyaline, with almost regular venation and 7 apical areas. A fairly narrow hyaline border along hind margin of wing, though distinctly broader than opaque border of tegmen.

Tymbals. Large, in lateral view covering more than half of body width. 6 transverse sclerotized ridges spanning the tymbal from dorsal to ventral margin and a 7th most proximal ridge spanning about three-quarters of tymbal width. 7 distinct intercalary ridges form a lateral band across tymbal.

Opercula. Male operculum (fig. 71) with weakly vaulted basal part as in *C. saundersii*. Distal part of operculum very different from that of *C. saundersii*, oblong and rather large relative to basal part, completely covering tymbal cavity in ventral view and distinctly extending medially beyond meracanthus. Lateral margin long, gradually and concavely bending into crest around distolateral corner of basal part and convexly bending into long and weakly convex distal margin. Distomedial corner broadly rounded, medial margin straight. Meracanthus reaching to about two-thirds of operculum length. Female operculum as in *C. saundersii* with erect and oblong distal part (cf. fig. 67).

Abdomen. Male abdomen ochraceous to green and unmarked, distinctly inflated, but not as globular as in *C. saundersii*; with dorsal margin (lateral view) not distinctly elevated relative to dorsal margin of thorax. First tergite not hidden under metanotum and medially only slightly shorter than 2nd tergite. Auditory capsules weakly developed, hardly protruding and not visible in dorsal view, but distinctly elevated relative to connecting bar between tymbal and abdomen. Tymbal cavity very narrow; auditory capsules fairly close together and tergite part between auditory capsule and 2nd sternite very short. Second tergite straight between auditory capsule and 2nd sternite and forming a fairly distinct crest along tymbal cavity. Female genital segment short and weakly swollen as in *C. saundersii*. Ovipositor sheaths not reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view swollen triangular and pointed at apex.

Male genitalia. Pygofer in lateral view as in fig. 73. Dorsal margin concave near base, but



Figures 69–77. *Cystosoma schmeltzi* Distant, 1882: 69, male head in dorsal view; 70, male postclypeus in lateral view; 71, male operculum; 72, base of right tegmen, male (*Cystopsaltria immaculata*); 73, pygofer in lateral view; 74, male caudodorsal beak in dorsal view; 75, pygofer in oblique view; 76, elasper; 77, aedeagus in lateral view.

strongly convex to apex of stout and short caudodorsal beak. Distal margin straight, forming an obtuse angle with margin of beak, angularly bending outwards at distal end, into weakly developed, slightly swollen and rounded lateral protuberance. Ventral margin weakly convex, but forming a broad and rounded inwardly curved corner just below this protuberance. Pygofer globularly swollen; pygofer opening very broad, broadest between lateral protuberances of pygofer lobes. Ventral margins converging to a very short and convex basal margin at base of pygofer opening; ventral part of pygofer opening U- shaped (fig. 75). Caudodorsal beak in dorsal view (fig. 74) very stout and broadly rounded at apex. Claspers (fig. 76) parallel to rounded apices, broad, square-shaped at base, with long and slender, downwardly directed apical part, curving inwards at angular dorsodistal corner and supporting aedeagus in upright position. Claspers fused at base to low collar around base of anal valves. Apical part of clasper with distinct but slender and sharply edged clasper hollow. Aedeagus (fig. 77) slightly upcurved, but recurving near apex, with very slender lateral crests and pair of broad rounded dorsal ridges. Aedeagal pore broad and oval.

Measurements. Body length ♂: 27.6 mm, ♀: 21.0 and 23.5 mm; tegmen length ♂: 28.2 mm, ♀: 29.0 and 32.3 mm; head length ♂: 2.7 mm, ♀: 2.7 and 2.8 mm; pronotum length ♂: 3.6 mm, ♀: 2.8 and 3.0 mm; mesonotum length ♂: 6.4 mm, ♀: 6.2 and 6.3 mm; head width: 5.4 mm, ♀: 5.3 and 5.5 mm; width of pronotal collar ♂: 8.0 mm, ♀: 7.5 and 7.9 mm.

Distribution. Eastern Qld and northern NSW. Moulds (1990) recorded the species from Mossman Gorge and Forty Mile Scrub, to inland northern NSW south to Gunnedah.

Remarks. C. schmeltzi is distinctly smaller than *C. saundersii* and has a less strongly inflated abdomen. The local name is "Lesser Bladder Cicada" (Moulds, 1990).

Cystopsaltria Goding and Froggatt

Cystopsaltria Goding and Froggatt, 1904: 559, 566, 661. — Distant, 1906: 154, 160. — Metcalf, 1963: 260. — Duffels and Van der Laan, 1985: 250. — Moulds, 1990: 196–197. — De Boer, 1992b: 18–19. — De Boer, 1993a: 16–17. — De Boer, 1993b: 142. — De Boer, 1995a: 8. — De Boer, 1995b: 3.

Type species. Cystopsaltria immaculata Goding and Froggatt, 1904.

Remarks. Cystopsaltria is a monotypic genus, closely related to *Cystosoma*.

Cystopsaltria immaculata
Goding and Froggatt

Figures 72, 78–80, 82–87

Cystopsaltria immaculata Goding and Froggatt, 1904: 566, 661, pl. xvii figs 1, 1a. — Distant, 1906: 160. — Burns, 1957: 644–645. — Metcalf, 1963: 260. — Duffels and Van der Laan, 1985, 250. — Moulds, 1990: 197–198, pl. 23 figs 3, 3a.

Material. Australia. Cairns, 9 km W., ii-iv.1985, 3♀, ZMA. Kamerunga near Cairns, N. Qld., 10.i.1977, M.S. and B.J. Moulds, ♂, ZMA. Mt Windsor Tableland, NW of Mossman, 30.xii.1980, M.S. and B.J. Moulds, ♀ *Cystopsaltria immaculata* G. and F. det. M.S. Moulds, ZMA.

Description. Body light brown (for photographs see Moulds, 1990: pl. 23 figs 3, 3a). Male abdomen strongly inflated 1.3 × head and thorax together, in females 1.0–1.1 ×. Tegmina of male 1.4 × body length, in females 1.3–1.4 ×.

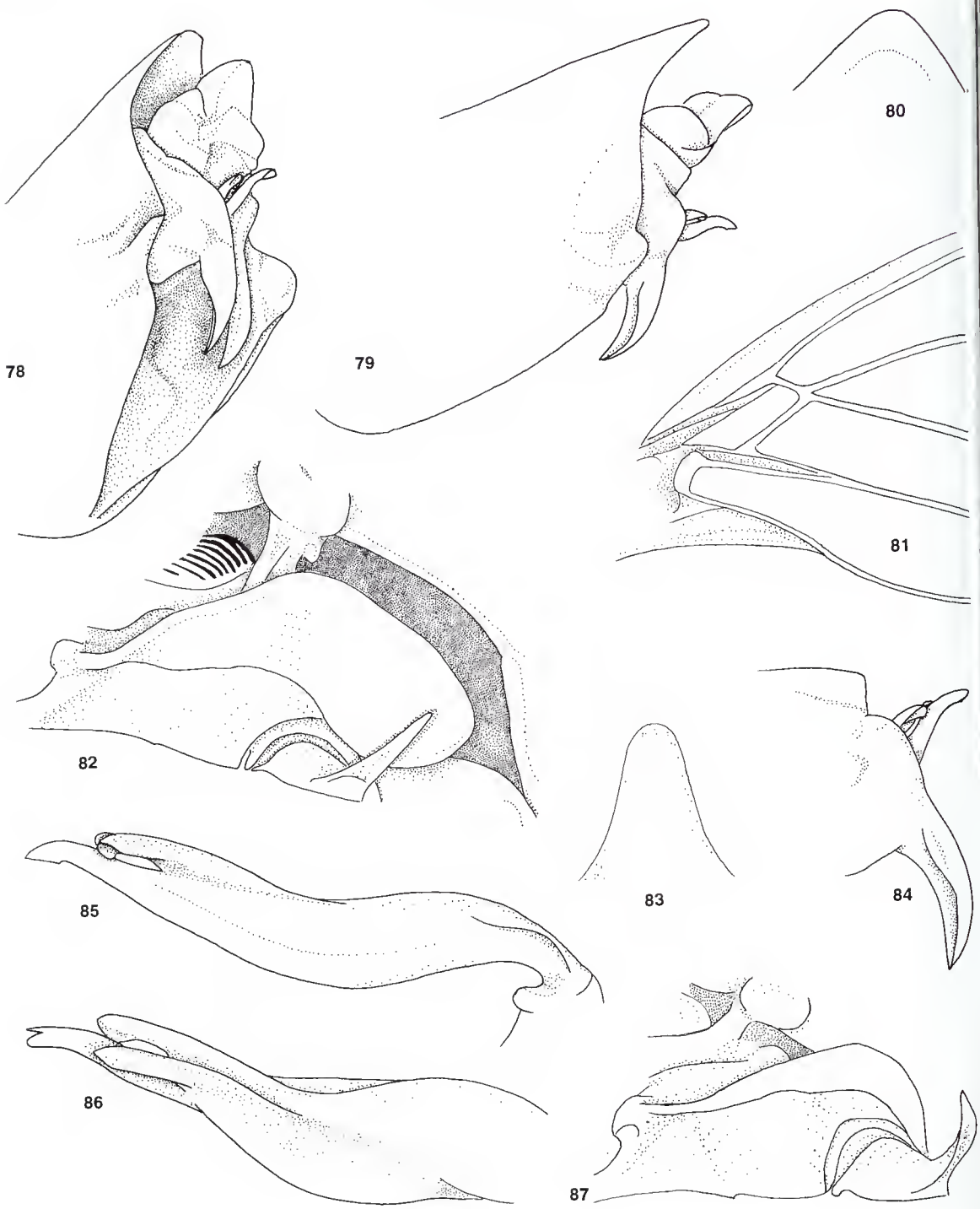
Head. As in *Cystosoma*, but with somewhat narrower vertex; ocelli more closely together. Distance between lateral ocelli 1.9–2.2 × width of frontal ocellus.

Thorax: Pronotum less distinctly pitted than in *Cystosoma*, in male smooth, but with a distinct medial furrow.

Tegmina and wings. Tegmina opaque greenish brown and reticulate as in the 2 foregoing species, but with very different pattern of veins. Distinctly more cross veins and larger part of tegmen reticulate; no regular ulnar areas. Veins M and CuA reach basal area separately. Radial area divided by extra vein, parallel to costa and fusing with vein M near corner of basal area (fig. 72). Tegmen with distinct, almost hyaline, cordial fold. Wings hyaline, with irregular venation as in *C. saundersii*, but with more (12–14) apical areas. Apex of wing tending to be reticulate, with several cross veins, especially near apex of first 4 or 5 apical areas.

Tymbals. Large, covering more than half of body width in lateral view. 8 transverse sclerotized ridges spanning the tymbal from dorsal to ventral margin, a 9th ridge spanning about three-quarters of tymbal width and a 10th most proximal ridge reaching to about half of tymbal width. 9 weak intercalary ridges form a lateral band across tymbal.

Opercula. Male operculum (fig. 82) resembling that of *C. schmeltzi*. Distal part of operculum oblong and rather large relative to basal part, covering greater part of tymbal cavity in ventral view and distinctly extended medially beyond meracanthus. Lateral margin long, forming an obtuse angle at about third its length,



Figures 78–87. *Cystopsaltria immaculata* Goding and Froggatt, 1904: 78, pygofer in oblique view; 79, pygofer in lateral view; 80, male caudodorsal beak in dorsal view; 81, base of right tegmen, male (*Cystosoma schmeltzi*); 82, male operculum; 83, female caudodorsal beak in dorsal view, Cairns; 84, clasper; 85, aedeagus in lateral view; 86, aedeagus in oblique view; 87, female operculum, Cairns.

angularly bending into crest around distolateral corner of basal part and angularly bending into long and weakly convex distal margin. Distomedial corner angularly rounded, medial margin weakly convex. Meracanthus reaching to about 3/4 of operculum length. Female operculum (fig. 87) much shorter than that of male. Distal part sickle-shaped, with angularly convex distal margin.

Abdomen. Ochraceous brown and unmarked. Male abdomen distinctly inflated, with its dorsal margin (lateral view) higher than dorsal margin of thorax. First tergite fairly short, middorsally less than quarter as long as 2nd tergite. Auditory capsules weakly developed, hardly protruding and not visible in dorsal view. Tymbal cavity much wider than in *Cystosoma*; tergite part between auditory capsule and 2nd sternite much longer than in that genus. Second tergite straight between auditory capsule and 2nd sternite and forming a distinct crest along tymbal cavity. Female abdomen as in *C. saundersii*. Ovipositor sheaths not reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view (fig. 83) stout, bluntly rounded at apex.

Male genitalia: Pygofer in lateral view as in fig. 79. Dorsal margin almost straight and continuous with short caudodorsal beak. Distal margin straight, concavely bent into margin of beak, angularly bending outwards at distal end, into distinct and angularly swollen lateral protuberance. Ventral margin straight and forming a very small corner just below this protuberance. Pygofer opening much narrower than in *Cystosoma*. Ventral margins converging to a sharp angle at base of pygofer opening; ventral part of pygofer opening V-shaped (fig. 78). Caudodorsal beak in dorsal view (fig. 80) very stout and short, broadly rounded at apex. Claspers (fig. 84) almost parallel to sharply pointed apices. Clasper broad, square-shaped at base, with long and very slender, downwardly directed apical part, curving inwards at angular dorsodistal corner, supporting aedeagus in upright position. Claspers fused at base to a low collar around base of anal valves. Apical part of clasper with distinct but slender and sharply edged clasper hollow. Aedeagus (figs 85, 86) very stout, swollen and slightly upcurved in proximal half, but more slender in distal half and recurving near apex. Aedeagus without distinct lateral crests, but with a pair of broad rounded dorsal ridges, ending in weakly outcurving subapical appendages. Aedeagal apex incised.

Measurements (mean ± sd): Body length ♂: 35.0 mm, ♀: 31.5–35.1 mm (33.7 mm ± 1.4); tegmen length ♂: 40.0 mm, ♀: 42.3–46.6 mm (45.1 mm ± 1.7); head length ♂: 3.4 mm, ♀: 3.2–3.9 mm (3.7 mm); pronotum length ♂: 4.6 mm, ♀: 4.6–5.0 mm (4.8 mm); mesonotum length ♂: 7.9 mm, ♀: 7.6–8.5 mm (8.2 mm); head width ♂: 7.4 mm, ♀: 7.4–7.8 mm (7.6 mm); width of pronotal collar ♂: 10.6 mm, ♀: 10.4–11.5 mm (11.1 mm).

Distribution. North-eastern Qld. Moulds (1990) recorded the species from Gap Creek south of Cooktown to Paluma.

Remarks. C. immaculata is in size intermediate between *Cystosoma schmeltzi* and *C. saundersii*. The species is easily recognized by the reticulate vein pattern of tegmina, extending over a larger part of the tegmen than in *Cystosoma*. Males can be recognized by their aedeagus with distinct dorsal appendages.The local name is "Rare Bladder Cicada" (Moulds, 1990).

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References

Ashton, H., 1912. Some new Australian Cicadidae. *Proceedings of the Royal Society of Victoria (n.s.)* 24: 221–229, pls xlix–li.

Ashton, H., 1914. Catalogue of the Cicadidae in the South Australian Museum, with descriptions of several new species. *Transactions of the Royal Society of South Australia* 38: 345–358, pl. xvii.

Boer, A.J. de, 1990. *Aedeastria*, a new cicada genus from New Guinea, its phylogeny and biogeography (Homoptera, Tibicinidae), preceded by a discussion on the taxonomy of New Guinean Tibicinidae. *Beaufortia* 40 (3): 63–72.

Boer, A.J. de, 1991. *Scottotympana*, a new cicad genus from New Guinea, with the description of three new species, their taxonomy and biogeography (Homoptera, Tibicinidae). *Beaufortia* 42 (1): 1–11.

Boer, A.J. de, 1992a. The taxonomy and biogeography of the *viridis* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). *Bijdragen tot de Dierkunde* 61 (3): 163–183.

Boer, A.J. de, 1992b. The taxonomy and biogeography of the genus *Thaumastopsaltria* Kirkaldy, 1900, (Homoptera, Tibicinidae). *Beaufortia* 43 (3): 17–44.

Boer, A.J. de, 1993a. *Guineapsaltria*, a new genus of the Australian-New Guinean region (Homoptera, Tibicinidae), with notes on its taxonomy and biogeography. *Bijdragen tot de Dierkunde* 63 (1): 15–41.

Boer, A.J. de, 1993b. Ten species added to the genus *Aedeastria* De Boer, 1990, with the description of eight new species and notes on the taxonomy and biogeography (Homoptera, Tibicinidae). *Beaufortia* 43 (9): 140–167.

Boer, A.J. de, 1994a. The taxonomy and biogeography of the *loriae* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). *Tijdschrift voor Entomologie* 137: 1–26.

Boer, A.J. de, 1994b. The taxonomy and biogeography of the *exhausta* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). *Beaufortia* 44 (5): 127–158.

Boer, A.J. de, 1994c. The taxonomy and biogeography of the *guttulinervis* group of the genus *Baeturia* Stål, 1866 (Homoptera. Tibicinidae). *Bijdragen tot de Dierkunde* 64 (2): 87–100.

Boer, A.J. de, 1995a. The taxonomy, phylogeny and biogeography of the cicada genus *Gymnotympana* Stål, 1861, (Homoptera, Tibicinidae). *Invertebrate Taxonomy* 9 (1): 1–81.

Boer, A.J. de, 1995b. The taxonomy and biogeography of the cicada genus *Papuapsaltria* gen. n. (Homoptera, Tibicinidae). *Tijdschrift voor Entomologie* 138: 1–44.

Boer, A.J. de, 1995c. Islands and cicadas adrift in the West-Pacific: biogeographic patterns related to plate tectonics. *Tijdschrift voor Entomologie* 138: 169–244.

Boer, A.J. de, 1995d. The phylogeny and taxonomic status of the Chlorocystini (Homoptera, Tibicinidae). *Bijdragen tot de Dierkunde* 65: 201–231.

Boer, A.J. de, 1996. *Mirabilopsaltria* a new cicada genus from New Guinea, its taxonomy and biogeography. (Homoptera, Tibicinidae). *Tropical Zoology* 9: 349–379.

Boulard, M., 1979. Révision de la faune cicadéenne des Iles Maurice et Rodrigues. *Bulletin de la Société Entomologique de France* 84: 27–47.

Burns, A.N., 1957. Check list of Australian Cicadidae. *Entomologische Arbeiten aud dem Museum Georg Frey* 8 (2): 609–678.

Daly, M.C., Cooper, M.A., Wilson, I., Smith, D.G. and Hooper, B.G.D., 1991. Cenozoic plate tectonics and basin evolution in Indonesia. *Marine and Petroleum Geology (MPGD)* 8 (1): 1–21.

Distant, W.L., 1882. On some undescribed Cicadidae from Australia and the Pacific Region *Proceedings of the Zoological Society of London* 1881: 125–134, pl. 7 figs 7–14.

Distant, W.L., 1905. Rhynchotal notes. — XXXIV. *Annals and Magazine of Natural History* (7) 16: 203–216.

Distant, W.L.,1906. *A synonymic catalogue of Homoptera. Part I. Cicadidae.* Trustees British Museum: London.

Distant, W.L., 1907. Rhynchotal notes.- XLIII. *Annals and Magazine of Natural History* (7) 20: 411–423

Duffels, J.P., 1977. A revision of the genus *Diceropyga* Stål, 1870 (Homoptera, Cicadidae). *Monografieën van de nederlandse entomologische Vereniging* 8: 1–227.

Duffels, J.P., 1986. Biogeography of Indopacific Cicadoidea, a tentative recognition of areas of endemism. *Cladistics* 2 (4): 318–336.

Duffels, J.P. and Boer, A.J. de, 1990. Areas of endemism and composite areas in East Malesia. Pp. 249–272 in: Baas, P., Kalkman, C. and Geesink, R. (eds). *The plant diversity of East Malesia: Proceedings of the Flora Malesiana symposium commemorating Professor Dr. C.G.G.J. van Steenis, Leiden, August 1989.* Kluwer Academic Publishers: Dordrecht.

Duffels, J.P. and van der Laan, P.A., 1985. Catalogue of the Cicadoidea (Homoptera, Auchenorhynga) 1956–1980. *Series Entomologica* 34: i-xvi, 1–414.

Froggatt, W.W., 1907. *Sub-order ii.- Homoptera Australian insects.* William Brooks and Co.:Sydney. xiv + 449 pp.; pls 1–37.

Goding, F.W. and Froggatt, W.W., 1904. Monograph of the Australian Cicadidae. *Proceedings of the Linnean Society of NSW* 29 (3): 561–670; pls 18–19.

Hamilton, W.B., 1979. Tectonics of the Indonesian region. *United States Geological Survey Profesional Papers* 1078: i-ix, 1–345.

Holloway, J.D., 1979. A survey of the Lepidoptera, biogeography and ecology of New Caledonia. *Series Entomologica* 15: i-xii, 1–588.

Holloway, J.D., 1984. Lepidoptera and the Melanesian Ares. Pp. 129–169 in: Radovsky, F.J., Raven, P.H. and Sohmer, S.H. (eds), *Biogeography of the tropical Pacific, proceedings of a symposium.* Association of Systematics Collection: Lawrence.

Jong, M.R. de, 1982. The Australian species of the genus *Lembeja* Distant 1892 (Homoptera, Tibicinidae). *Bijdragen tot de Dierkunde* 52 (2): 175–185.

Jong, M.R. de, 1985. Taxonomy and biogeography of Oriental Prasiini 1: The genus *Prasia* Sål, 1863 (Homoptera, Tibicinidae). *Tijdschrift voor Entomologie* 128: 165–191.

Kato, M., 1932. *Monograph of Cicadidae.* 450 pp. 32 pls.

Kato, M.,1956. *The biology of cicadas — Bulletin Cicadidae Museum.* Iwasaki Shoten, Jinbocho Kanda: Tokyo. 319 pp., 46 pls.

Kirkaldy, G.W., 1907. Some annotations to M. Distant's recent Catalogue of the Cicadidae. (Hem.). *Annales de la Société entomologique de Belgique* 51: 303–309.

Metcalf, Z.P.,1963. *General catalogue of the Homoptera, VIII. Part 2. Tibicinidae.* North Carolina State College: Raleigh. iv + 492 pp.

Moulds, M.S., 1990. *Australian cicadas.* NSW University Press: Kensington. 217 pp.

Musgrave, A., 1953. Seasonal occurrence of cicadas. *Australian Museum Magazine* 11: 10–15.

Pigram, C. J. and Davies, P.J., 1987. Terranes and the accretion history of the New Guinea orogen. *Journal of Australian Geology and Geophysics* 10: 193–212.

Rangin, G., Jolivet, L. and Pubellier, M.,1990a. A simple model for the tectonic evolution of the southeast Asia and Indonesia region for the past 43 m.y. *Bulletin de la Société géologique de France* (8) 6 (6): 889–905.

Rangin, G., Pubellier, M., Azema, J., Briais, A., Chotin, P., Fontaine, H., Huchon, P., Jolivet, L., Maury, R., Muller, C., Rampnoux, J.-P., Stephan, J.-F., Tournon, J., Cottereau, N., Dercourt, J. and Ricou, L.E., 1990b. The quest for Tethys in the western Pacific. 8 paleogeodynamic maps for Cenozoic time. *Bulletin de la Société géologique de France* (8) 6 (6): 907–913.

Schremmer, F., 1957.*Singzikaden Neue Brehmbücherei 193.* A. Ziemsen Verlag: Wittenberg-Lutherstadt. 47 pp.

Stål, C., 1863. Hemipterorum exoticorum generum et specierum nonnullarum novarum descriptiones. *Transactions of the Royal Entomological Society of London* (3) 1: 571–603.

Swofford, D.L., 1993. *PAUP: Phylogenetic Analysis Using Parsimony, version 3.1.1.* Illinois Natural History Survey: Champaign.

Walker, F., 1852. Supplement. *List of the specimens of Homopterous insects in the collection of the British Museum* 4: 1119–1188 [1119–1168], 8 pls. British Museum: London.

Walker, F., 1862. Characters of undescribed species of Homoptera in the collection of F.P. Pasco, F.L.S. *Journal of Entomology* 1 (5): 303–319, pl. 15.

Westwood, 1842. Illustrations of some genera belonging to the family Cicadidae. Vol. 1 (6), pp. 81–96, pls xxi-xxiv in: Westwood, J.O., *Arcana entomologica; or illustrations of new, rare and interesting exotic insects*: Will. Smith: London.

Westwood, J.O., 1851. Descriptions of some new species of exotic homopterous insects. Vol. 1, Appendix D, pp.432–434, pl. 4 in: Eyre, E.J., *Journals of expeditions of discovery into Central Australia and overland from Adelaide to King George's Sound.* Boone: London.